

PC MAGAZINE

VOLUME 5 NUMBER 18
OCTOBER 28, 1986

Taming Communications

IBM'S
NEXT GENERATION
286-BASED XT

*PC Labs
Tests 34
Modem
Programs:*

- *How Fast?*
- *How Powerful?*
- *How Easy?*

- **Bargain ATs:**
8 Compatibles Under \$2,000

- **R:base Series 5000 and
dBASE III Plus**
Go Head-to-Head
on a Network



How Borland is helping bring the America's Cup back to America!

"In the America's Cup, they don't give Gold Medals for second place"



Buddy Melges, skipper, "Heart of America," and one of the best helmsmen in the world.

Buddy Melges knows about medals. He's won both Olympic Bronze and Gold (Soling Class, '72) and he knows there is no medal for coming in second in the America's Cup race.

"In this race, there are two reaching legs where anyone who doesn't fall overboard looks good, but the real deal is in the four upward legs and two downward legs. That's where you have to disadvantage your opponent, outsmart them, outguess them, and outtell them, and I think the kind of analysis Reflex provides is giving us a real edge," says Melrose.

"Borland's support has been both welcome and generous, and their interest in us is a lot more than the fact that we use Reflex* (and SideKick* and Turbo Pascal*).

In fact, they didn't know we were using so many Borland products until we made a Tech Support call. They were more than helpful. Then one thing led to another, and now Borland is one of our sponsors. We're flying a Borland spinnaker, and they've even given us the full-time help of one of their top technical guys who's going down to Australia with us at Borland's expense. Philippe's an avid sailor and is so competitive that he keeps challenging us to race him in his boat here in Santa Cruz for the Borland Cup."



"Heart of America" sporting its new Bontex gunnaker, surging downwind Santa Cruz, California

"So if trim tab angle is 4 degrees, windspeed's 21 knots and heel angle is 27 degrees, what's our best possible boat speed?"

Alex Brincko, "Heart of America,"
12-meter racing yacht

Insant answer needed—because this is no academic question, this is a race! The America's Cup race, and the stakes are high. So Reflex: The Analyzer,* answers that question and the next question and a thousand other questions that stream at 4800 baud from Heart of America, one of the American contenders in the 1987 America's Cup races in Australia.



And in pure Reflex action, the graphs come up and the right answers race in.

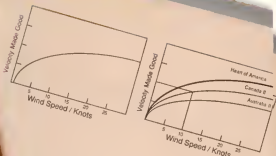
Wrong answer and you lose. Wrong move and you're history—because a wrong tack will cost you that critical 30 seconds that it takes a 12-meter yacht to get back up to speed.

America's Cup races are tactical, chess-game kind of races where the boats are usually equally fast, but the race pattern is speed, speed, slowdown, speed, speed, slowdown—and the slowdowns are tacks, sail changes, wrong guesses on the wind, and dumb moves on the high seas.

The Heart of America crew knows all that and more, and they're using Borland's Reflex-The Analyst to "Bring The Cup Up!" So here's to them all—and *Don't Leave Perth Without It!*

CIRCLE 138 ON READER SERVICE CARD

"There is no second prize" Omar Bradley



Borland's Instant Winner Game

Scratch this card now and you could *instantly* win 2 free round-trip airline tickets to Australia for the America's Cup Race!



\$10,000

First Prize (\$10,000 value!) includes accommodations for two in Perth, Australia

during the final America's Cup races, which start January 31, 1987. See America win it back after our *only* loss in 134 years! There's more than one *instant winner* in Borland's

Instant Winner Game, because you could win one of two new \$6,895 4-WD Suzuki Samurai convertibles,



\$6,895

printer, or a \$4,499



or a \$4,995 AST TurboLaser™

\$2,399 Toshiba T1100™

Toshiba T3100,™ or a

AST SixPakPremium™, or a \$69.95 Traveling SideKick,® or

Plus, or a \$595

any one of hundreds of other Borland products—and at



\$69.95

the very least a Borland Rebate Coupon, good for \$10 off any single product or \$15 off any bundled product offer!



\$4,499

See Official Rules on the back of this card for details.

Don't delay! There will be a second-chance drawing for the trip if not claimed by 12/30/86. There's also a second-chance drawing for the two Suzukis if not claimed by 2/28/87. All rebate coupons are good for products purchased 9/6/86-3/31/87. Product prices above are suggested list prices.

Rub the silver bar to reveal whether you win a prize or get a rebate coupon. Then fill in the second-chance entry blank to the right.



Second-Chance Sweepstakes Entry!

We're running two Second-Chance Sweepstakes drawings to award the trip and cars. They will be won by someone—it *could be you!* Fill in the entry coupon and mail it now. Winners will be notified immediately, because the final America's Cup races start in Australia on January 31, 1987, and you'll have to pack in a hurry.

(You will need a valid passport and the ability to comprehend Australian versions of the English language.)

Name _____

Address _____

City _____

State _____ Zip _____

OFFICIAL RULES - BORLAND INSTANT WINNER GAME

1. **NO PURCHASE NECESSARY:** To participate, you may obtain a game card inserted into the October, November, December, or January issue of the following magazines: PC World, Byte, PC Tech Journal, PC Magazine. You may also obtain a game card by mailing a self-addressed, stamped envelope to: Borland International Game Card, P.O. Box 870, Wino, CT 06097. (Washington State residents send self-addressed envelope.) Limit one game card per stamped request. All requests must be received by January 15, 1987.

2. **TO PLAY:** Remove the rub-off area on the game card to reveal what prize or prizes you have obtained.

3. **PRIZES/REBATES:** Beneath the rub-off area one of the following prizes may be revealed: Trip for Two to America's Cup Races or \$10,000; 1986 Suzuki 4-W Suzuki Convertible or \$8,895; AST Turbo Laser; Toshiba 1100 Portable Computer; Toshiba 3100 Portable Computer; AST Advantage; AST Advantage; AST 2 GPa; AST Rampage; AST Rampage AT; Free Borland Product, or you may obtain the following rebate offer: \$10 rebates offer on any individual product or \$15 rebates offer on any single advertised Borland product (See rule #11 for prize details).

4. **PRIZE CLAIMS:** If you obtain one of the prizes stated in Rule #3, sign your full legal signature on the game card and send via certified mail (copy should be made for your records) along with your name and address to: Borland International Prize Claims, 180 Century Road, Wino, CT 06097. All prize claims must be received or postmarked by February 15, 1987. (See Rule #12 for Trip for Two to America's Cup exception.)

5. **REBATE CLAIMS:** Rebates are good for products purchased from September 5, 1986 through March 31, 1987. The \$10 rebate is good for any individual Borland product and the \$15 rebate is good for any advertised Borland software bundle. To receive your rebate you must return your completed rebate agreement from the manual, the game card and dated proof of purchase to: Borland International, Game Card Rebates, 4585 Scotts Valley Drive, Scotts Valley, CA 95068. Upon receipt of the rebate agreement, game card and proof of purchase, Borland will send your check. Rebates are not valid with any other rebates or promotional offers directly from Borland.

6. **VERIFICATION:** All game materials are subject to verification. Game materials are void and will be rejected if not obtained through authorized, legitimate channels, and may be rejected if any part is reproduced, counterfeited, torn or altered in any way, or if materials contain printing, typographical, or mechanical errors. Disclosures of the Redemption Center are final. Game pieces from any game other than the Borland Instant Winner Game may not be used in this game.

7. **CONDITIONS OF PARTICIPATION:** Material submitted becomes the property of Borland International. The submission of game pieces is the sole responsibility of the individual seeking verification, who is solely responsible for lost, torn, or mislabeled mail. All taxes, registration and inspection fees are the sole responsibility of the verified winners. Winners may be required to execute an affidavit of eligibility and name and likeness publicity release. By participating in the game you accept and agree to be bound by these rules and the decision of the Official Redemption Center which will be final.

8. **ELIGIBILITY:** Participation is open only to residents of the United States 18 years of age and over, except employees and agents of Borland International, service agencies, and individuals engaged in the development, production, or distribution of game materials. The Marxist Group, Inc. and their immediate family or members of their households. Void in Vermont and where prohibited by law.

9. **GAME SCHEDULE AND AWARD OF PRIZES:** The Borland Instant Winner Game will commence on or about September 5, 1986 and end on January 30, 1987. It will officially end, however, when all game pieces are distributed. Verified game prizes will be awarded within thirty (30) days from the date of their receipt for verification at the Official Redemption Center. A major prize winner will be selected by random drawing. All can be obtained by sending a stamped, self-addressed envelope to: Borland Instant Winner Game Winner List, P.O. Box 7085, Wino, CT 06097.

10. **ODDS CHART:** The odds of winning prizes are based upon obtaining the one true game piece among the applicable number of game pieces.

Prize	Qty.	Total Value	Odds of Winning
Trip for Two to America's Cup or \$10,000	1	\$10,000.00	1 in 6,458,000
Suzuki 4-W Suzuki Convertible or \$8,895	2	\$17,790.00	1 in 3,229,000
AST Turbo Laser	1	\$4,059.00	1 in 6,458,000
Toshiba Portable Computer	2	\$8,098.00	1 in 3,229,000
AST Memory Boards	25	\$10,075.00	1 in 258,220
Borland Products	1,000	\$148,000.00	1 in 6,458
OVERALL TOTAL	1,831	\$168,798.00	1 in 6,284

All remaining game cards will contain a \$10 rebate good on any individual Borland product or a \$15 rebate good toward any advertised Borland software bundle.

11. **PRIZE DETAILS:** Trip for Two to America's Cup Races (or \$10,000) will include coach seating round trip airfare on regularly scheduled commercial airfare from San Francisco, California to Perth, Australia and up to two weeks hotel accommodations in Perth, Australia plus \$4,500 spending cash. Winners will be responsible for obtaining visa, passport, and all other travel documents. Trip does not include meals, taxes, in-room language charges and other local charges. Must be accompanied by parent or legal guardian.

Suzuki 4-W Suzuki Convertible (or \$8,895) verified winner will be responsible for all registration, insurance, and licensing fees. AST Turbo Laser; Toshiba Portable Computer Model # T1100; Toshiba Portable Computer Model # T1100; AST Memory Boards and Free Borland Products are non-refundable except by sponsor due to product availability and of warranties and guarantees are subject to manufacturers terms. All prizes are non-transferable. Winner (consumer is responsible for all local, state and federal taxes).

12. **SECOND CHANCE SWEEPSTAKES:** There are two Second Chance Sweepstakes drawings scheduled to be conducted on December 31, 1986 and February 28, 1987. Random drawing from all entries received by December 30, 1986 will award trip for two to America's Cup Races (or \$10,000). Random drawing from all entries received by February 28, 1987 will award two (2) Suzuki 4-W Suzuki (or \$8,895). All remaining prizes that are unclaimed after February 15, 1987 will remain unclaimed. Send entry to: Second Chance Entry P.O. Box 870 Wino, CT 06097.

If you have any questions concerning the Borland Instant Winner Game, call 1-800-461-4471.

If You Use Lotus 1-2-3, You Need Reflex!

NEW!

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Unique, easy-to-use database management and analysis system. With Reflex, when you look, you see, because it shows you patterns and interrelationships that ordinary spreadsheets and database managers hide in data and numbers. It's also the greatest complement to 1-2-3.* Your "What-ifs?" are all answered, and you use Reflex's Form View, List View, Graph View, Crosstab View or Report View to take a revealing new look at what your numbers really mean. Adam B. Green of InfoWorld wrote, "Everyone agrees that Reflex is the best-looking database they've ever seen." Peter Norton of PC WEEK says, "The next generation of software has

\$10.00 Scratch 'n Win Rebate!



officially arrived." Minimum memory: 384K. Suggested Retail: \$149.95 or only \$139.95 if you use a Borland Rebate coupon. (You can get both Reflex: The Analyst and Reflex Workshop for only \$199.95, and this advertised "bundle" offers you a \$15.00 Rebate, which means you pay only \$184.95 for both!)

NEW! Reflex for the Mac® version now available!

\$15.00 Scratch 'n Win Rebate on all Xmas packs!

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___ MS-DOS ___ CP/M-86

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If within 80 days of purchase you find that this product does not perform in accordance with our claims, call our customer service department and we will gladly arrange a refund.

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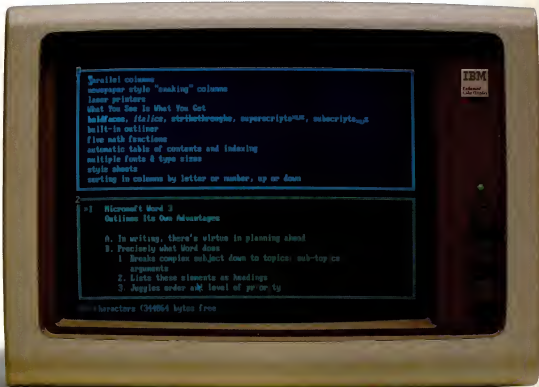
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Microsoft Word 3. It outlines its own advantages.



The virtue of planning ahead is never more apparent than when you set out to make a point on paper. Which is precisely why we included a built-in outline program in Microsoft® Word Release 3.

Armed with the outliner, it's a simple matter to organize your thoughts before you write. Take a complex subject, break it down into a long roster of topics, subtopics, or arguments.

List all of these elements as headings. Then juggle their order and their level of priority. In Microsoft Word 3 the outline and the document it frames are linked. So you can jump back and forth between

the outline and your work. Collapse long manuscripts down to manageable main elements. And restructure the entire piece by simply moving the headings.

Then watch your ideas fall into place.

Watch this live demonstration.

Any kind of writing can benefit from the gentle discipline imposed by the outliner. A good for instance is the ad you're reading right now. Say you had to write it. If Word were your writing instrument, you'd simply list its many attributes, stream-of-

**I. Microsoft Word 3
Outlines Its Own Advantages**

- A. In writing, there's virtue in planning ahead
- B. Precisely what Word does
 - 1. Breaks complex subject down to topics, sub-topics, arguments
 - 2. Lists these elements as headings
 - 3. Juggles order and level of priority
- C. Outline and document are linked
 - 1. Jump between outline and work
 - 2. Collapse manuscripts down to main elements
 - 3. Restructure the entire piece by moving headings
- D. Even ad writing could benefit
 - 1. (List this ad's elements at random)
 - 2. Live demonstration
 - a. (Ad outline goes here)
- E. Word delivers what it promises
 - 1. What You See (on the screen) Is What You Get (printed on the page)—WYSIWYG
 - a. Boldfaces, underlines, italics, strikethroughs
 - b. Superscripts^{x2}, subscripts_{xyz}
- F. Word squeezes the most out of printers
 - 1. Drives over 100 different printers
 - a. Dot matrix
 - b. Impact
 - c. Laser
 - 2. Take advantage of latest laser printers
 - a. An extensive collection of fonts
 - b. Multiple fonts on a page
 - c. Proportional spacing
 - d. Microjustification
- G. Word saves time and effort
 - 1. Style sheets
 - a. Save complex formats of letters and forms
 - b. Set up those formats with a keystroke
 - 2. Glossaries
 - a. Save and instantly retrieve boilerplate
 - b. Contract clauses, headings and closings
 - 3. "Windowing"
 - a. View several documents or different parts of the same document simultaneously
 - b. Copy and move text easily between documents
 - c. Save time and bother of shutting down and opening files

consciousness style. The way it's displayed on the screen above.

Then, after designating each feature or thought as a heading, you electronically rearrange these random facts into something resembling real, organized writing. Like the very professional looking printout on the right side of the page.

**We think you
get the idea by now.**

By now you not only understand pretty clearly how the outliner works, you've got a good overview

of the new and amplified capabilities of Microsoft Word 3 for the IBM® PC and compatibles.

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Microsoft® Word 3**
The High Performance Software

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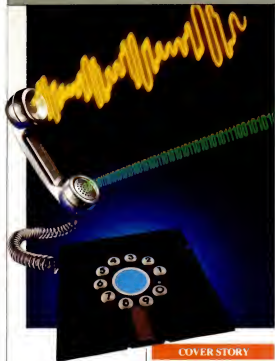
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PC12286

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CIRCLE 168 ON READER SERVICE CARD



COVER STORY

Asynchronous Communications: Shopping for Software

M. David Stone/PC communications, the quiet application, have evolved further than you probably realize. And there's plenty of product choice: 34 programs by our count, ranging in price from free to \$250—all of them benchmark-tested by PC Magazine Labs and reviewed in-depth for performance and value. 126



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FEATURES

COMPUTERS

The Cheapest ATs Ever

Jon Pepper and Joe Desposito/The AT-compatible market heats up, with new price-conscious and option-laden competitors. You may not get a whole lot of documentation and you could be taking a chance with follow-up service support, but for advanced power and features these eight low-cost AT alternatives, from American Micro Technology, WIN Laboratories, FiveStar Electronics, HiTech International, Eltech Research, Wells American, Club AT, and Alphanumeric International, are worth investigating. 203

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*Glenn Hart/*Long a standard tool of engineers and architects, industrial-size D- and E-size plotters handle large-format



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Cover Photograph:

Roberto Brosan

WHAT'S INSIDE



M. David Stone

In this issue, longtime contributor M. David Stone takes charge of our cover story on communications software. Stone, a computer and communications consultant who has also written three computer-related books, says that not all of his memories of work on computer communications are fond ones. "I remember wiring my first RS-232 cable," he reminisces. "I looked at the pinouts and figured it was going to be a piece of cake. A couple of hours later, I actually got the machine to talk to the modem."

Disgruntled as Stone may be by the sorry mess of RS-232 nonstandardization, he remains enthusiastic about the proliferation and advancements of communications products. "Most users are too set in their ways," says Stone. "If you're going to ride the leading edge of communications software, you've got to look at the alternatives. We're a long way beyond *PC-Talk III* and *Smartcom II*."

With the help of a team of technical writers and PC Magazine Labs, Stone developed evaluation criteria and benchmark tests that prove speed isn't the only consideration when choosing a communications package.

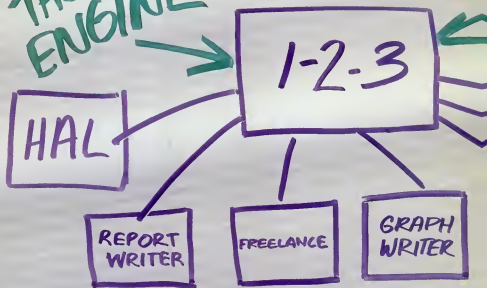
At least one of the 34 programs that Stone and his team tested should have the right combination of features, ease of use, and power to make your communications as transparent as they ought to be. The results, which begin on page 126, should help influence your future buying decisions.

Communicating by network presents problems of a different sort. Users want to transport their single-user database applications to multiuser, networked machines. Before DOS 3.1, lack of standards was an obstacle. At one point, Ashton-Tate was forced to withdraw its early networked version of *dBASE II* from the market. Bloody but unbowed, Ashton-Tate returned with networking support in the latest version of *dBASE III Plus*. Ever the willing contestant, Microrim was there waiting with its *R-base* version. Both *R-base Series 5000* and *dBASE III Plus* take advantage of the new standards. On page 285, Alfred Poor compares these networked databases, with some practical, real-world analysis and recommendations.

Also in this issue: detailed evaluations of cheap PC AT alternatives, those proliferating machines that are, according to every mode we've got, putting the fear of competition into IBM's marketing department—and not without reason. Can you really get AT power for under \$2,000—even under \$1,500? See "The Cheapest ATs Ever" on page 203 for the answer.

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LETTERS TO PC MAGAZINE



D-O-W-N ON DVORAK

John C. Dvorak's first Inside Track (*PC Magazine*, Volume 5 Number 14) was cheap and insulting. The article had only a small paragraph about Boeing's 3-D spreadsheet, but it devoted a whole section to how not to dress or decorate your office. Boeing and I do not need a lesson in style from someone who hasn't enough taste to have his double chin cropped from his cameo. I consult *Esquire* when it comes to my personal habits, and *PC Magazine* when it comes to my personal computer.

Charles Zaloom
Washington, D.C.

Anyone who is willing to knock a new product (Boeing's 3-D spreadsheet) because of the manufacturer's office furniture or the brand of wristwatch worn by the programmer is far too venal and superficial for my taste (John C. Dvorak's Inside Track). Spell it S-T-U-P-I-D. Maybe Dvorak could grow some tolerance?

Michael Russell
Moscow, Idaho

It is unfortunate that John C. Dvorak's Inside Track had to debut with a personal attack against Boeing. To draw the conclusion that this corporation has an "old-fashioned" perspective because of a perceived lack of elegance is very judgmental. Is Mr. Dvorak qualified to be a judge of elegance? (We have only limited evidence from which to work—that of his photograph on the front cover.) In any case, Mr. Dvorak came off sounding like Joan Rivers on a bad day. His suggestion to Boeing was "Grow some taste." My suggestion to him is "Grow up."

Timothy W. Dunn
Lilburn, Georgia

QED VERSUS LOTUS

In his article "1-2-3 Learning Aids: Many Paths to Proficiency" (*PC Magazine*, Volume 5 Number 14), Christopher Barr states that our tutorial, *Lotus 1-2-3 Made Easy*, is similar to the free Lotus tutorial packaged with 1-2-3. We believe this statement is misleading. The only similarity between the two products is that they both provide a student workbook and a data disk.



Lotus 1-2-3 Made Easy also competes successfully with all the other courses reviewed. It uses Lotus to teach Lotus and presents the material in a logical and simple manner. For example, it presents one concept or action per page which guides the student page by page, screen by screen, and shows the results of all the student's critical actions. Narrow columns, effective use of bold type, and keyboard layouts also contribute to its ease of use. Lotus's tutorial, although nicely done, does not present the material in as usable a fashion as our course. The real cost of education isn't the cost of the course but rather the time it takes to learn and use the material. In this case, "free" can be misleading.

Edwin F. Kerr
QED Information Sciences
Wellesley, Massachusetts

Christopher Barr replies:

As I wrote in the article, I believe neither tutorial (QED's for \$75 or Computer Tutor Corp.'s identical one for \$49.95) is any better than 1-2-3's own tutorial. In fact, while 1-2-3's tutorial has a section specif-

cally covering the improvements made in Release 2, QED's Lotus 1-2-3 Made Easy makes no reference to Release 2 at all. In my opinion it makes little sense to spend more money for something of equal or lesser value.

IBM RESPONDS TO DVORAK

John C. Dvorak's column ("IBM Product Centers: The Final Analysis," *PC Magazine*, Volume 5 Number 14) contained references to IBM and its employees that were offensive and untrue.

Dvorak's irresponsible assertion that IBM never intended to make money on its Product Centers is ludicrous, as are numerous other claims that are based on nothing more substantial than a seemingly endless supply of anonymous sources. Had Dvorak verified the facts before publication, he would have discovered that since 1980, when IBM opened its first Product Center, the centers succeeded in their goals of reaching customers, promoting product awareness, selling a great deal of IBM equipment, and establishing high standards for computer product retailing.

Finally, all Product Center employees were extended offers by IBM. The choice to remain with IBM or join Nynex was completely their own.

N.C. Lautenbach
President
IBM Corp.
National Distribution Division
Montvale, New Jersey

In rereading Dvorak's column, we find that Dvorak agrees with most of Mr. Lautenbach's points. Mr. Lautenbach, however, doesn't refute Dvorak's basic tenet that IBM never intended to make money on the Product Centers.—Ed.

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LETTERS

DVORAK FAN

PC Magazine has finally arrived with its introduction of John C. Dvorak. I loved his work even when it was printed on cheap pulp newspaper. I mean, this guy has class, spelled L-O-W, and taste, too, spelled N-O-N-E. But most of all, he has the experience, knowledge, and guts to give us the inside track on what is really going on out there in Microcomputer Land. You can bet many of your readers will dive for his column first.

Curt Hess
 Woodbridge, Virginia

AN ARTIFICIAL CONFLICT

I feel compelled to correct a misconception that Peter Norton expressed in his column "Display Screen Issues" (PC Magazine, Volume 5 Number 13). The artificial-horizon instrument mentioned does not function precisely as he described. In fact, the "airplane" is fixed and the "horizon" moves as if the pilot were looking at the true horizon.

Mark Pomeroy
 Shreveport, Louisiana

Peter Norton made a serious error in his statement regarding the way artificial horizons in aviation are conceived and viewed. In reality, flying any airplane is done by determining the attitude, or tilt, of the airplane by using the fixed horizon as a reference. The world stays fixed, and the pilot determines how much he has tilted. Basic flight training uses the horizon outside the window as a reference, and subsequent training simply substitutes the artificial horizon for the real one.

David R. Pierce, Jr.
 San Luis Obispo, California

Peter Norton replies:

Between David Pierce and Mark Pomeroy, I don't know who is right, but I do gather that I was wrong on the specifics of aircraft instruments that I used as an example. However, this only proves the point I was making: that human-interface issues (such as, what does "page-up" mean?) are subtle and confusing matters, prone to subjective disagreements.

Contributing editor Richard Aarons, a commercial pilot, also replies:

■ "Style checkers" are no substitute for a rigorous education in English grammatical structure or for the development of a personal writing style.

Almost all artificial horizons—or attached indicators as they are more often called—have an "airplane" fixed to the case with a moving "horizon." Several experiments have been performed with inside/outside displays—that is, those in which the airplane moves against the fixed world behind it—but few have succeeded. Even our military's Heads Up Display uses a moving-horizon/fixed-airplane display.

AGAINST ADVICE

After reading Jim Seymour's "Advice and Consent" (PC Magazine, Volume 5 Number 11), I couldn't help but think that the philosophy of software design that Mr. Seymour espouses is, in part, consistent with the philosophies that are responsible for the diminishing quality of language education in this country. If software were developed that would flag and correct all the "errors" that Mr. Seymour thinks are necessary to remedy, it could be partially responsible for the homogenization of business and creative writing.

While on-line spelling-checkers and thesauri relieve us from the drudgery of searching through the printed versions, they do not truly make our writing decisions. However, a computer "correcting" our writing style is analogous to a car telling us the best way to drive to work. "Style-checkers" are no substitute for a rigorous education in English grammatical structure or for the development of a personal and creative writing style.

Edward J. Zohn
 Westfield, New Jersey



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InfoWorld, 1985

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■ LETTERS

Jim Seymour replies:

As a correct-English zealot, a sworn enemy of badly phrased sentences and misspelled words, I must say that I find it a bit odd to be responding from out here in the Land of Diminished-Quality Language Education. However, I think we're closer on this than your letter suggests. As I said in the column, I want writer-helpers to "advise" while I consent—or decline. Any computer software that can offer writers useful advice on demand with but a few keystrokes, gets my vote.

CORRECTIONS

The IBM EGA technical reference manual, *Options and Adapters Technical Reference Manual*, no longer costs \$125 as mentioned in the sidebar "In Pursuit of the IBM EGA Technical Reference" ("Achieving the Standard: 12 EGA Boards," *PC Magazine*, Volume 5 Number 14). IBM has reduced the price of the manual, now called *Enhanced Graphics Adapter*, to \$9.95. The manual number is 6280131, and it may be ordered directly from IBM by calling (800) 426-7282.

The price of The Finot Group's *KeepTrack Plus*, Version 1.03, hard disk utility and extended DOS services program ("Software Safety Nets for Hard Disk Data," *PC Magazine*, Volume 5 Number 14) is \$79.

PC-DESK III ("Desktop Organizers: Top-Notch Efficiency Tools," *PC Magazine*, Volume 5 Number 10) is an optional memory-resident program. Also, the calculator overflow reported in the article has since been corrected.

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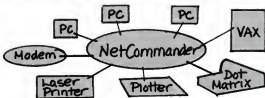
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If you use Lotus, C6™ or Wizard, and have 386, you can compile your C program without ever leaving Brief. It finds the lines with errors and marches you through the text for repairs.

Parts of Brief were written with its own Lisp-like macro language which has structure, 32-character variable names, conditional execution, loops, and you can actually read it. Notice how the hieroglyphs we've seen elsewhere: Bulletin board and public domain disks with macros. "Simply the best text editor you can buy." Drexler highlights. (Needs 198K.)

Ask for Last PC Brand U0690 \$95 Call

HALO GRAPHICS SYSTEM Multi-Board Graphics Library

The premier graphics library that got the ball rolling for PC-based graphics and has become so omnipresent that it supports over 25 graphics boards—including IBM's EGA and Nt. 9 Revolution's ixe series—and has a multitude of mouse and printer drivers. All that in each box. Separate C versions for Lotus, Microsoft, and DOS. What does Multi-Halo do? A down to the last pixel graphics library plus functions to read drivers so distributed program can run on anything. Windows native or single screen. Flexible licensing available for redistribution. Specify 50315 & Language. Last \$300, Vc \$219, Wt Hal o II, a free-standing "part." Last \$440, Vc \$299.

dbc Lattice Library Maintains dBASE Compatible Files With the Power and Speed of C

dBC™ links C to dBASE. It creates and maintains files and their indexes which exactly replicate dBASE file design. So dBASE can read and update them. And the reverse dBASE can use any files created by dBASE. New C and dBASE can operate on the same data bases interchangeably.

That opens up the widespread culture of dBASE installations to exploration by C programmers. Tap that market, avoid the redundant dBASE language, and gain the advantages of C with this single product. dBC's functions parallel all dBASE's file handling commands, many decomposed to give closer control. Each backed by demo source files on disk.

WINDOWS for C/WINDOWS for DATA Microsoft Windows™ and TopView™ Compatible

Windows for C™ is a library of over 80 functions to add the pizzazz and practicality of window partitioning to your application. Unlimited windows, each defined in C structure for easy selection throughout your program, can be made either to pop up or permanently overwrite the screen. Routines will scroll and highlight lists with arrow keys, will read and scroll ASCII files directly, and scroll horizontally in windows, and even write to memory-loaded files off the screen.

Logical treatment of video attributes permits unchanged programs to run on color or monochrome. Colors of windows are set individually.

All functions are in separate modules, only those used are linked. Only buffers holding characters or temporarily obscured windows occupy RAM, others released dynamically. Best overall rating and fastest loading in Bit Hunt's 7/85 Tech Journal. One of five Windows products.

Windows for Data comprises all of Windows for C but takes in data through the windows as well. At the high level a single function lets you specify text, string, field length, data type, screen location, picture, target variable, then sets lesser functions according to get and process a user's input. There are utilities to get system date and time, mess with strings, create your own masks for fields.

Field options can require entry, prevent entry, permit select or override, beep on invalid or overflow, length errors, and attachment of field-specific help messages.

C-TREE B-Tree File Manager, Source Code, No Royalties!

C-tree is a study code that has weathered many seasons of prolonged and widespread use. It comes in C source, as you can use it for a personal case. No royalties provided you give us your binary application.

C-trees design splits nodes to allow any number of uses to access at index file sequentially or randomly. But updates are in progress. So multi-user configurations and adaptation to networks are possible. Record-looking routines are provided for

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and functions you want called to display messages or validate entries. And you decide which keys will clear a field, jump to the next or prior, exit, etc. Options diverse enough that a set of "fields" can be made to behave like a Lotus™ menu.

Specify Compiler Last PC Brand
T0110 Windows for C \$95 \$149
T0150 Windows for Data \$95 \$149

MICROSOFT C 4.0 A Great C Battle Rages and You're Winning

As the deadweights pound each other with less heinous ordinance, today's programmers reap the spoils of that war. Bundling a source debugger and a "make" and sporting a "huge" memory model permitting single data objects larger than 64K, the Microsoft C compiler has jumped a full version number to 4.0. But what's really impressive are the benchmarks reported in Dr. Dobbs (8/86) and elsewhere, or more fully in PC complements.

Microsoft's and IBM's C (purchased from Microsoft) run away with the contest winning 11 of 27 benchmarks. The CodeView™ debugger, free for a limited time, uses windows to show everything on one screen: source alongside disassembled object, variables, stack and registers. Drop down windows—use a mouse if you like—create leaping of commands. "A source-level debugger that puts the rest

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We refund the purchase price of any product returned within 30 days of purchase, fully restorable condition. You can even try our programs themselves! product code begins with E 7 or L through N. — even if means breaking the disk seal. Some developers do pose limits on for products beginning with other letters opening sealed disks opens letters of acceptance. But you can at least review the manual. There's just nothing stopping your buying from PC Brand.

to shame" (Dobbs). Microsoft C now has fine memory models for code and data, plus no library support for another thirteen, and boasts alternate math packages for speed versus accuracy, with or without 8087/80387 chips. A big plus in multi-language settings is that from that C any routine in lower versions of Misp Pascal, FORTRAN, or Macro Assembler. Object code of all four may be intermixed come link time or conmingled into libraries.

Both linker and library manager are part of the package, as is the "make" a UNIX™ name for a smart batch program which knows to expand minimum effort to rebuild any size of project by compiling and assembling only elements affected by new or changed modules.

It is necessarily used by Lotus, Ashton-Tate and, finally, Microsoft itself to develop Windows. Dobbs calls it "the best MS-DOS C development environment value today [B]ut variously any kind of program convertible. 386K supported."

Ask for Last PC Brand C0350 \$450 \$295

CURSES Unix Style Screen Management

Curses from Lotus™ manages the screen of the PC like Unix's curses. Library of 84 functions and macros parallels Unix with matching parameter lists. So Unix programs are at home on the PC and vice versa. Keeps any number of screens in memory, supports color, wait function set to get characters, wrap lines, scroll, black lines, highlight, etc. Late Unix references screen only on your computer. Ask for L0650 Last \$250, Vc \$99. With Source L0650 \$250 \$199.

PANEL Feature-Laden Screen Design Tool

Writing your own screenware can be a slow, complex chore and painful. Panel™ works with you interactively to set up foolproof screen displays and data entry forms rapidly. Output is C source code.

Not just single-pane: layer your screen designs with up to ten overlapping images. Background pop-up lists, help boxes, and alternate input fields.

Panel builds in a user interface for keyboard movement within and between fields, supplies validation routines for

checking user field entries. Diverse attributes allow complex data and program size, data type, color, conversion of input to upper case, clearance of existing data when new entry is started, masks for standard formats (e.g., dates), phrases which fill in when first letter is entered, multiple-choice lists from which to choose by cursoring a highlighted bar. Fields may be multi-lined and scrolled if larger than the screen space allotted them. Specify S0400 & Compiler Last \$295, Vc \$229.

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GREENLEAF **Bountiful Functions**

C source assembler source, and binary libraries of 225 functions for many computers. Emphasizes light functional groups to minimize loading code which your application may never use. Manual helps select functions, bulletin board, too.

A sampling: COB extensions for file and directory manipulation, Screen to select mode, save, monochrome or color, palette, cursor shape, positioning, clearing and scrolling, post get and put, read light pen. Strings, Center, justify, etc., efficient list operations which add, delete, sort string pointers for top speed. Other graphics characters: pointers, keyboard status, function key assignment, time/date, read registers and memory, save, peek, and poke. Manual best seller. Specify 50770 & Compiler List **985**, Here **139**

PFORCE **Phoenix Function**

Phoenix didn't do badly pulling it all together in one place. Phoenix has followed suit with the ultimate integrated C library, offering everything from low level functions for hardware access to complete in-tree database management. Along the way are prerequisites such as string manipulation, trimdate, field and screen editing, but also four styles of menus (Lattice included), windows, background tasking, DOS extensions, directory management, even interrupt-driven communications. Design emphasizes objects, so characteristics of windows, databases, records and fields can be obtained and changed outside functions.

One large collection in place of bits and pieces means one set of instructions and *PFORCE* has hundreds, extensive examples, quick reference, and on-line help. Everything in source, no royalties, all memory models of Lattice. Month. Specify: 50202 & Compiler List **415**, PCB **949**

GREENLEAF **Relio World Communications**

Want your application to communicate with other users or remote data bases by asynchronous communications built right into your C program? Even if you don't need it now, that's a skill to have at the ready! 120 functions and demo programs in both C and assembler source code set up separate transmit and receive ring buffers for up to 32 simultaneous channels. Interrupt driven so you can halt an incoming record, display it, file it, let the user edit it, then continue. Goodbye separate communications software.

Supports up to 9600 baud, ASCII or binary, any parity or word length, 8250 UARTs, Xon/Xoff and Xmodem. What track record? Specify 50770 & Compiler List **985**, US **139**

PRE-C **Pick the List from Your Program**

Pre-C is like UNIX in that it finds problems your compiler won't. Problems that a debugger will have trouble figuring out. Even problems which would cause trouble with other compilers.

Compilers see one module at a time. Modules only meet at link time. Pre-C looks at all modules at once and reports conflicts in data type declarations, function call parameters which disagree with functions, machine-dependent expressions which inhibit portability. It spots obsolete usage (even C changes), casts with suspect conversions, variables never used, functions never called, unreachable code. Adheres to UNIX Syntax C1 compile standard to ensure portability. Ask for P0580, List **936**, Cust **478**

DAN BRICKLIN'S DEMO PROGRAM

Storyboard Your Program

The Legendary One has created Metaphor. Two when the rest of us are still at Zero. Dan's first was the original electronic spreadsheet (VisiCalc™). This one is for programmers.

Words don't express program ideas because programs are scenes. Dan's Demo creates slide shows. Create a screen — a snapshot of your planned product as it runs. Anything goes: words, borders, box rules, arrows and underlining of monochrome, fore- and background color. Copy this "slide" to an empty screen. Change it a little to show the next instant of time. Do it again. Presto, a whole slide show of your program in action.

All 250 characters and attributes are available from scrollable lists which pop to the screen. All commands are layered in Lattice-style pop-up menus. Frequent choices mapped to function keys as well.

80x25 character mode, not bit-mapped. Screen areas can be blocked for cut and paste of slide with color or characters, even blank. Slides can overlay on others, can be shuffled, deleted. Slides can proceed at time intervals or branch anywhere in the slide sequence depending on user keyhits.

Invaluable to prototype the program you are about to write, to position the labels, choose the color design, smooth out the keyboard interface. Or load the "capture" utility and snapshot the screens of any running program for an instant slide show.

Each copy entitles you to redistributable fifty of the slide projector program that runs. Demo plan, no binder keeps price of big product small. "Muth: become the essential tool in... use interface programming." Tech Journal. Ask for L0101, List **475** US **469**

BASTOC **OPTIMIZES!**

Translates BASIC Into C

For a trifling price, BASTOC™ moves the trackloads of BASIC code over to C. It's a translator which takes in Microsoft Extended BASIC and emits pure K&R C for Lattice 3.0. It will optionally convert your program into a single monolithic C function or decompose it into separate functions, one for each GOSUB label.

Version 3's optimization dramatically reduces execution time. Converts to in-terminators where variables in BASIC programs which do not need floating point. Where BASIC uses full assignment statements to increment counters, BASTOC converts to C's compound form. String dynamically allocated making your application of BASIC's catenated bytes for garbage collection. Creates structure of even convoluted BASIC code. Huge workarounds. Ask for L0101, List **495** US **399**

Shopping List for the Power Workbench

ASSEMBLERS & DEBUGGERS		LIST	OURS	GRAPHICS		LIST	OURS
Advanced Trace-86 Morgan, ASM Interpreter		175	149	Essential Graphics by Essential, no royalties		250	210
Codemeter by Micro-Software Developers		165	139	GSS Kernel System by Graphic Software		495	399
CSD Debugger C source level by Mark Williams		75	75	GSS Kernel System for IBM RT		795	670
C-Sprite Debugger by Lattice, source level		175	139	GSS Metatile Interpreter		295	249
Microsoft Macro Assembler		160	160	GSS Plotting System		300	210
PASMB6 by Phoenix, Macro Assembler		295	219	Halo Graphics Kernel System		300	210
Periscope I Debugger Data Base Decisions		295	299	with Dr. Halo II, by Media Cybernetics		440	290
Periscope II Data Base Decisions		129	111	COMMUNICATIONS		LIST	OURS
Plus86 Plus by Phoenix, Symbolic Debugger		395	279	Asynch Manager by Blaise, for C or Pascal		175	149
BetterBASIC Summit Software		195	185	Grandeur Compiler by Grandeur of		139	139
BetterBASIC Utilities 8087 Math Support		99	85	PII by Phoenix, Binary File Communicator		195	149
Briefing Interface		99	95	Software Horizons Pack 3		440	119
Run-Time Module		225	129	UTILITY LIBRARIES		LIST	OURS
Microsoft BASIC Interpreter for XENIX		350	295	Blaise C Tools Plus C Tools 2		175	149
Microsoft QuickBASIC Compiler for BASICA		99	79	Blaise C Tools		125	95
Professional BASIC by Morgan		99	79	Blaise C Tools 2		100	99
RM-BASIC by Ryan-McFarland		600	449	C Food Smorgasbord by Lattice		100	99
True BASIC True BASIC Inc.		150	119	C Utility Library by Essential, 300 functions		185	139
Run Time Module		500	420	Extended Functions by Essential Software		395	299
Var Call		Var	Var	Flora by Phoenix, user library		475	349
True BASIC Libraries: Binaries, Asym, Sort, etc.		Var	Var	Software Horizons Packages		250	199
				Toolbox Tool Basics by Lattice, source level		Var	Call
C COMPILERS		LIST	OURS	DEVELOPMENT TOOLS		LIST	OURS
C-86 Compiler Compiler Innovations		395	299	Code Sifter by David Smith Software, Prologer		119	99
Lattice C Compiler from Lattice		500	299	C-Worthy by Custom Design Software		295	299
Let's C Compiler by Mark Williams		75	99	C-Worthy for Network Menus, helps errors		495	449
with CSD Source Level Debugger		150	129	Dan Bricklin's Demo Program Prototyper		75	99
LWC-86: Mark Williams C Development		495	389	LMK from Lattice to Lattice, "make" like UNIX		195	149
Microsoft C Compiler 4.0		450	295	Microsoft Window Development Toolkit		500	385
C INTERPRETERS		LIST	OURS	PC-Link by Gimpel Software, under UNIX's "ln"		139	125
C-mp by Gimpel Software		300	249	Printch by Phoenix, ETC performance analyzer		295	279
Instant C by Rational Systems		500	395	Pinch Plus Utilities memory for overlays		495	359
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RUN/C without Loadable Libraries		120	109	Printch Plus Phoenix products		1295	85
TEXT EDITORS		LIST	OURS	OTHER TOOLS		LIST	OURS
Brief from Solution Systems		195	149	BASTOC by JMI, convert BASIC to C		495	399
Editor by Lyngby Software, the EMACS		255	199	BASIC-C by JMI's converts added to C		175	139
FirstTime by Source Technology, C syntax		225	229	THE HAMMER by ODS Systems		395	279
Kedit by Metatext, similar to Xedit		125	115	Ritview by Softcraft, Binary Report Generator		85	75
Lattice, the Lattice Screen Editor Multi Window		125	110	Xtrieve by Softcraft, Query Utility for Btrieve		195	175
Text Editor by Phoenix, Multi Window		125	110	FORTRAN COMPILERS & UTILITIES		LIST	OURS
Text Management Utilities Grep, split, diff, etc.		120	100	ACS Time Series by Alpha Computer Service		495	399
Wedit by Compview		150	119	Fortb-Plus by Alpha Computer Service		70	59
Wedit Plus by Compview		225	180	Microsoft FORTRAN Link with Microsoft C		350	219
FILE MANAGERS		LIST	OURS	Microsoft FORTRAN for XENIX		495	399
Btrieve by Softcraft, no royalties		250	195	Pro FORTRAN by Prologer		390	345
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C-btree by FairCom — no royalties, source		385	329	Scientific Subroutine Library by Pterless		175	149
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Visual Manager for C by Blaise		295	279	Plotix Phoenix's new disk manager		195	149
Vitamin C by Creative Programming		150	139	Pro Pascal by Prologer, ISO Validated		390	345
Windows by Gimpel Software		125	99	Win/COBOL by Ryan-McFarland		450	359
Windows for Data includes Windows for C		295	279	RM/COBOL by ANSI & COBOL		1295	85
Z View Data Management Consultants		245	199	Source Print Alphanumeric diagrammer		139	109

Five Tips On Buying A Personal Computer Through The

Buying by mail is one of the best ways there is to purchase computer equipment. It's fast, convenient and cost efficient. But with those benefits comes a risk... many of those inexpensive PC clones can turn into expensive headaches after arriving in the mail.

Before you order PC equipment from anyone through an ad, make sure it passes the following test. Taking a minute now could save you a lot of money... and a lot of aggravation.

1. Does the product come complete?

Many mail-order outfits leave out monitors, display cards, disk drive controllers and other essentials in an effort to keep the advertised price low. By the time you add in the cost of these components, you may not be getting such a "bargain" after all.

2. Is the machine fully tested?

Any computer is only as reliable as its components, so make sure it has passed a rigorous Quality Control test.



Don't be bashful; call the company and ask if the machine is built primarily with domestic hardware or inferior "offshore" parts. While you're at it, ask for reprints of any product reviews from respected publications like this one (if they can't provide any, don't take a chance—no matter how low the advertised price is).

3. How compatible is the BIOS?

Everyone claims some degree of "compatibility," yet frequently these same machines won't run some popular software packages. If a mail-order outfit can't tell you what BIOS their machines use, steer clear (The AMI BIOS is generally considered the most compatible).

4. Does the machine meet FCC specs?

Many price-cutting PCs don't meet FCC "Class B" home-use guidelines. That means they could interfere with your television, stereo and other appliances. Watch out for disclaimers in the ad, or PCs rated to less demanding "Class A commercial" FCC standards.

5. What is the company's reputation?

Sometimes you can tell a "fly-by-night" outfit just by looking at its hastily-prepared, slipshod ad. But even if their ad looks slick, keep up on the product reviews in magazines like this one. Or better yet, call the editors directly and ask them.

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PC ADVISOR

Help in getting the best keyboard with mail-order ATs, using floppy disks with a Toshiba T3100 portable, and saving desk space.



MIXING AN IBM KEYBOARD WITH AN AT CLONE

IBM has excellent keyboards and high prices. Compatibles have mushy, toylike keyboards but low prices. Is it possible to buy the keyboard alone from IBM and connect it to either the PC's Limited AT or PC Designs' ET-286?

Carlos Ju
Los Angeles, California

In theory, it's not a bad idea. We revved up both machines with a standard IBM AT keyboard and had no problems. However, we strongly advise that you avoid the newer AT keyboard (with 12 function keys and separate pads for numbers and cursor keys). During testing of the enhanced keyboard, operation was normal except when any of the newly added keys were hit; the machines would not accept the input. The enhanced keyboard was designed in tandem with an updated ROM BIOS for the AT; most compatibles duplicate the earlier AT BIOS (see Peter Norton's column "The New PC AT BIOS: Some Subtle Changes," PC Magazine, Volume 5 Number 16, for an explanation of this).

The hard part will be finding someone to sell you an IBM keyboard. IBM's response was "we are not in the business of selling keyboards." They're only interested in sales of complete systems. A good place to ask is at a users group meeting; many attendees will probably own several systems with parts they no longer need and might be interested in making a deal. Retailers who sell specialized keyboards, such as KeyTronics or RapidWriters, may

have taken in an IBM on trade. It's certainly worth a try.

I'm afraid it may be a long search.

ACCESSING 5 1/4-INCH DISKS WITH A TOSHIBA T3100

I own an IBM PC and have accumulated an extensive software library over the years. Recently, I purchased a Toshiba T3100 portable with the 5 1/4-inch floppy drive. As you know, the T3100 uses 3 1/2-inch drives. Since I want to use my current software for the IBM PC on the T3100, is there a way I can copy from the 5 1/4-inch disks onto the 3 1/2-inch disks? I'm trying to avoid buying a 5 1/4-inch drive for the T3100.

Ellory Yu
Green Bay, Wisconsin

Toshiba offers the PC Floppy Link for just this purpose (Toshiba America Inc., Tustin, Calif.; (714) 730-5000; \$199). The PC

Floppy Link is a half-height board for a PC or AT, it connects to the floppy controller card and to a port on the T3100. While it's running, the Floppy Link gives control of the floppy drive to the Toshiba; an external switch lets you return control to the PC or AT.

A cheaper way to move your files is with an RS-232 null modem connection directly between the two computers. One disadvantage to this method is the extra time it will take to move the files through the serial connection. You can pick up the cable for \$15 to \$30 and use just about any communications program that supports file transfers; see this issue's cover story, "Asynchronous Communications: Shopping for Software," for help in choosing a good one.

STANDING A CPU ON ITS SIDE

Will it hurt a hard drive to put the system unit on its side, as the Curtis System Stands do?

David Lavin
Van Nuys, California

Unlike LP turntables, disk drives do not rely on gravity to access data. Many PC Magazine editors run their CPUs, with and without hard disks, at right angles for extended periods without experiencing any problems.

ASK THE ADVISOR

Send your questions about hardware and software choices you are facing to the PC Advisor, PC Magazine, One Park Avenue, New York, NY 10016.

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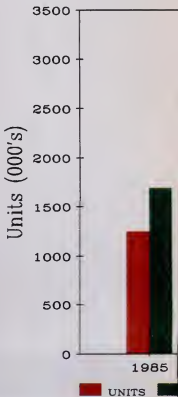
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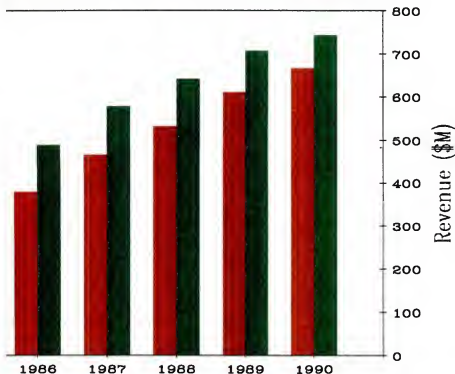
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PC
 MAGAZINE

FIRST LOOKS

IBM Revs Up the XT with a 286 and Zero Wait States

PC HANDSON

Zero-wait-state processing gives the PC-XT, Model 286, calculation speed competitive with the 6-MHz AT—but the big difference is in the hard disks.

BY CHARLES PETZOLD

It used to be so simple to tell them apart. The IBM PC has floppy disk drives, the XT has a hard disk, and the AT has a hard disk and an 80286 microprocessor. But IBM has put together an 80286 and a 20-megabyte

hard disk in a box that looks like an XT; calls it the XT, Model 286; and sells it for \$3,995—\$900 less than a comparably equipped AT.

What is this thing? Is it just as good as an AT? What are you



A new AT-style keyboard comes standard with the \$3,995 PC-XT, Model 286; monitor and graphics adapter are extra.

giving up if you buy an XT, Model 286, instead of an AT? If you recently shelled out \$5,295 for an AT, should you be kicking yourself?

Extending the PC Family

The XT, Model 286, is not an AT in an XT case or an XT with an 80286 in it. The whole system board is new. The 80286 in the XT, Model 286, is clocked at 6 MHz, but the memory accesses require no wait states. The processor speed of the XT, Model 286, falls somewhere between the one-wait-

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R:base System V Packs Enough Of a Punch to Challenge dBASE

PC HANDSON

BY RICHARD AARONS

After a 1-year redesign program, Microrim has brought its *R:base* relational data management system into the heavy-hitting circle of full-featured, multiuser database applications development systems that's now dominated by Ashton-Tate's *dBASE III Plus*.

R:base System V replaces the earlier *R:base Series 5000*. Microrim says that the reworking was done to incorporate "customer suggestions" and that the project required some 24 man-years to accomplish.

Earlier versions of *R:base* were useful for some business applications, but a complete lack of all but the most fundamental arithmetic facilities made it practically useless for technical and scientific applications.

Business Applications

R:base System V corrects those deficiencies. The new system adds financial functions, computed columns in database tables, a variety of mathematical functions (exponential, trigonometric, and hyperbolic), string manipulation, data and time operations, and date-conversion functions.

In addition, *R:base System V* now supports screen-oriented file import from and export to other software products, including *1-2-3* and *dBASE II* and *III*, plus a Zip command that allows you to run DOS-compatible programs without leaving *R:base*.

R:base System V's multiuser feature is compatible with a variety of IBM, Novell, and 3Com networks.

Express Generator

One of the major selling features of *R:base Series 5000* was its Express application generator, which enabled you to set up

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XT Model 286

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state 6-MHz and 8-MHz ATs, depending upon the type of test. The system board has a full 640K bytes of memory—an IBM first for the PC line. Like the AT, the system board includes a clock and CMOS RAM with battery backup for configuration information. Instead of DIP switches, you must run an AT-type SETUP program when changing hardware.

The 80287 math coprocessor socket is located at the extreme front edge of the system board. To install an 80287, you have to remove the disk controller board and the two plastic card guides at the front. The card guides must be replaced upside down because of the height of the 80287 chip. They work fine

that way, but somebody was asleep when this was designed.

The XT, Model 286, has an XT-style case and an XT footprint. You can install a second floppy disk drive (including a newly available 3½-inch internal drive), but you do not have room inside for a second full-height IBM hard disk. Even if you had, you might run into power-supply problems. The Model 286 power supply is rated at 157 watts, while the AT (which can accommodate a second full-height hard disk) has a 192-watt power supply.

Tight on Expansion Space

IBM's PC AT has eight expansion slots, including two using the old 8-bit connectors and six longer slots for the 16-bit data lines and 24-bit address lines of the 80286 microprocess-

Is There Magic in the "ATjr"?

Interesting, all these "ATjr's" we're starting to see. They're not quite ATs, though they use the 80286 chip that powers an AT.

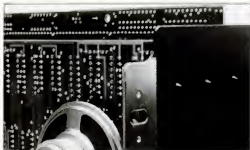
ITT ISD started the game with the ITTtXraXP, and it was followed by Tandy Corp.'s 3000HL; now comes IBM with the PC-XT, Model 286. And we've heard there are more coming out soon.

The real question is, What market are these retro-ATs intended for? They're not likely upgrades for XT users; the performance-improvement ratchet is too small. And it's hard to imagine an AT user wanting to move down to one.

First-timers afraid of buy-

ing on the hindsight of the technology curve will find them interesting, but with real AT clones selling for \$1,200 to \$1,500, you can have a true AT-class PC for about half of what IBM's XT, Model 286, costs. IBM's put some interesting new goodies in the box—a new motherboard, some 16-bit expansion slots, a built-in clock (finally). But is that enough?

Tandy's play is easier to understand. Consistent with chairman John Roach's desire to capture the small-business market (which I think is highly likely), Tandy needed a more up-to-date, in-house design to replace its aging HD1200 XT



The XT Model 286's 16-bit slots work fine with AboveBoard/AT and other AT-compatible expansion cards—just don't try to put the cover back on.

sor; all of the AT slots can accommodate full-length boards. The XT, Model 286, has three 8-bit slots and five 16-bit slots. One of the 8-bit slots will accommodate only a very short (one-third length) board; another one might just possibly fit a full-length board if you move the disk controller board, carefully reroute the disk cables, stick in a piece of cardboard to prevent the side of the floppy disk case from shorting out the board, burn some incense, and

chant the IBM mantra. You're safer accepting the fact that you have two very short slots.

We installed an Intel Above Board/AT in one of the 16-bit slots, and it worked fine except for one problem: we couldn't get the XT, Model 286, cover back on. The AT box is about an inch taller than the XT box, and board manufacturers have used the extra room to squeeze in a few more chips on AT boards. The extra height is too much for the XT case.



Benchmark Tests: IBM PC-XT Model 286 vs. IBM PC-XT and 8-MHz IBM PC AT

Times given in seconds and decimal seconds.

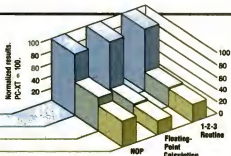
Product	NOP	Floating-Point Calculations	1-2-3 Routine
IBM PC-XT	10.11	155.32	250.00
IBM PC-XT Model 286	5.55	36.97	78.00
8-MHz IBM PC AT	4.17	34.41	73.81

The 128K NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessor and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The Floating-Point Calculations benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentiation, and logarithmic and trigonometric functions. The test program uses the floating-point library included with Microsoft C 3.0.

The 1-2-3 Routine benchmark test for spreadsheet applications, designed for a 640K environment, assesses the computational speed and RAM management capabilities of the machine by using a 1-2-3 macro that performs a series of both global and individual worksheet tasks. The macro copies and recalculates a 10-

cell range 490 times, moves 1,000 cells, deletes 1,000 cells, and then systematically clears the spreadsheet.



Dramatically faster performance results from IBM's replacement of the 5085 processor with an 80286 in the XT. The Model 286 runs at 6 MHz; so it still can't beat an AT running at 8 MHz, but zero-wait-state processing helps the XT make up some of the difference (AT memory accesses require one wait state).

clone. The 3000HL fills just that role: it's smaller, faster, more up-to-date, close to the old HD1200 price—and, of course, there will be a lot of Radio Shack price promotions built around it.

The IBM entry smells like yet another of Big Blue's famous "account control" products: machines intended to widen the buyers' choices but also confuse them, with the ultimate goal of keeping them in the fold. But with IBM's XT, Model 286, selling for so much more than faster, more-capable AT clones, you've got to ask: Is there really enough magic for those buyers in the letters *IBM* to justify paying twice as much for half as much? Silly question.

—Jim Seymour

(XT Model 286 continued)

Shame on IBM for needlessly introducing yet another expansion board specification. Undoubtedly, the board manufacturers will rush to fill the gap (or, more precisely, narrow it), but it's a silly problem. In the PC Magazine Labs, several people—known more for their brilliant ideas than for having the initiative to market them—suggested that somebody simply come out with an XT, Model 286, replacement cover an inch taller than IBM's.

So far we've mentioned relatively minor differences between the AT and the XT, Model 286. The big difference is the hard disk. IBM rates XT hard disks at an 85-millisecond average access time and AT hard disks at 40 milliseconds. The XT, Model 286, definitely has an XT, not an AT, hard disk.

The actual difference in average

access times is even more pronounced than the ratings. The Core hard disk test measures most AT hard disks in the vicinity of 33 milliseconds, but the XT, Model 286, hard disk clocked in at 96 milliseconds. Other tests won't come close to this extreme differential, but there it is—the biggest performance difference between the AT and the Model 286.

If You're Confused...

If you've been planning to get an AT, get an AT. If you've been planning to get an XT and an accelerator board, get the XT, Model 286. If you're still confused, here's my new rule for differentiating the IBM machines: the PC has floppy disk drives, the XT has a hard disk, the AT has an 80286, and the XT, Model 286, has its cover off because the AT expansion boards are too big.

PC FACT FILE

IBM PC-XT, Model 286

IBM Corp.

Contact your nearest authorized IBM dealer.

List Price: \$3,995, including a 20-Mbyte hard disk, one 1.2-Mbyte floppy disk drive, 640K RAM, serial/parallel board, and keyboard

Requires: Video adapter and monitor.

In Short: It's an XT. No, it's an AT. No, it's...it's...it's something only IBM could dream up. It's a combination of AT processor speed, XT hard disk speed, and an annoying problem with AT expansion boards.

CIRCLE 426 ON READER SERVICE CARD

R:base System V

(continued from page 33)

data tables and straightforward applications by answering questions on menu screens. *R:base System V* improves the Express generator significantly by extending the concept to forms and reports. Screens can be tailored with borders, data-coded colors, and temporary data values without writing any code.

Programmers will find *R:base System V* has expanded individual program line limits to 5,000 characters, making drafting of complex expressions and the use of new note-type variables more straightforward.

The new Express package supports visual-view definition, visual-rules definition, custom data entry forms, custom reports, custom macros, and database structure modification with data loaded.

You can have multiple colors in data entry forms, multiple-row entries in a single form, forms containing up to five screens, forms modifying up to five tables, reports containing up to ten break levels, and time stamps in forms and reports.

Micromin has also improved *R:base Series 5000's* overall look and user interface with a

prompt-by-example structure for all commands, personal key mapping, keystroke files with record/playback, automatic data dictionary updates, and automatic installation.

Table Limits Expanded

Table limits have been pushed outward, too. The new specifications call for maximums of 80 tables per database, 800 columns per database, and 4,096 bytes per row. Maximum rows (records) per table and rows per database are limited only by the maximum file size allowed by DOS.

R:base System V supports new data types, including a note type (up to 4,092 characters). Other types include date (1 to 30 characters), currency (up to 14 places), integer (up to 9 places), real (6 significant digits), double (15 significant digits), text (1,500 characters), and time (1 to 20 characters).

Table-Conversion Utility

For all practical purposes, *R:base System V* is a completely new program, so some conversion is required for data tables created under earlier *R:base* versions. A utility for table con-

SELECT ALL FROM version SORTED BY depto WHERE

Select columns for conditions - Press (ESC) for options

Column	Operator	Value
40	depto	EQ 100

In *R:base System V's* prompt-by-example mode, if the command you need is not listed, you can exit temporarily to the editor and customize your own command.

PC FACT FILE

R:base System V

Micromin Inc.

3925 159th Ave. NE

Redmond, WA 98073

(206) 885-2000

List Price: \$700

Requires: 512K RAM for single user or 640K for LAN operation, hard disk.

In Short: Full-featured, table-oriented relational database with applications development tools for setting up tables, screens, and reports. The program now supports important math and string functions.

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version comes with the new release.

At first look, *R:base System V* is an excellent program that nicely answers the shortcomings of earlier Micromin offerings. The best news for registered owners of *R:base Series 5000* is that they can upgrade to *System V* for \$99. Those who take Micromin up on this offer will get a full-featured system that rivals anything produced by Ashton-Tate.

NEC's AT-Class PC: Sturdy Value, Strong on Graphics

PC HANDSON

BY JON PEPPER

There are so many low-priced AT clones now flooding the market that it is possible to occasionally miss the arrival of powerful machines from major companies. NEC Information Systems' APC IV is a case in point, a truly fine AT that definitely deserves attention.

The APC IV is, significantly, the first machine that NEC has designed from the ground up for the U.S. market and for complete PC AT compatibility. The result is everything an AT-class machine should be and then some.

The metal case is not small at 21 by 16 by 6 inches, but it's well packed with 640K bytes of RAM, two RS-232 ports and a parallel port (all on the motherboard to save slots), a hefty 213-watt power supply, a clock/calendar, and eight (two 8-bit and six 8/16-bit) expansion slots.

One disk drive comes standard with the APC IV: the ubiquitous 1.2-megabyte floppy disk drive. The system unit contains enough space for up to five half-height storage devices; and two floppy disk drives, two hard

disk drives, and a tape backup unit can all run on NEC's standard drive controller (unfortunately, not sold separately). MS-DOS 3.1 and GW BASIC are also standard.

The APC IV is marked by intelligent design. For example, the clock speed switch (6 or 8 MHz) is located under a recessed lip on the front panel, and so it is easy to use but almost impossible to trip accidentally. A reset switch is cleverly front-mounted as part of the three-position key lock; you use the system key to activate it.

The keyboard has an AT-style layout. Tactile response is excellent. Oversized Shift, Enter, and CapsLock keys add to the keyboard's appeal. A nice addition would be a separate numeric key pad.

Choice of Monitor, Board

NEC offers a choice between two monitors (an Advanced Color Display and a Power Graphics Display) and between three graphics boards (a Color, an Advanced, and a Power Graphics board).

The review unit featured the Advanced Color Display and Advanced Graphics board, which are roughly equivalent to

the IBM EGA board and Enhanced Color Display. I use the word *roughly* because the combination from NEC easily outdistanced the IBM combo on all counts. Mounted on a sturdy tilt-and-swivel base, the ACD monitor has a 14-inch screen, which looks like the popular NEC MultiSync but isn't. With a resolution of up to 800 dots by 560 lines possible, however, it still has more graphics potential than most people are likely to use.

A text switch on the ACD monitor allows you to change the display color, independent of software, to any one of seven colors. Although the brightness control doesn't totally dim the screen, NEC engineers say that this was intentional. Apparently, the phosphor used will not produce phosphor burn when left on, a problem on some displays.

EGA/CGA Compatible

NEC's Advanced Graphics board is EGA and CGA compatible, and it performed flawlessly. Text and graphics are crisp and well defined, with absolutely no ghosting or flicker, so there's little eyestrain over a long viewing period. The board

PC FACT FILE

NEC APC IV

NEC Information Systems Inc.
1414 Massachusetts Ave.
Boxborough, MA 01719
(617) 264-8000

List Price: Base unit, \$2,495; with 40-Mbyte drive and Advanced Graphics Display and board, \$3,995; 20-Mbyte drive and Advanced Graphics Display and board, \$3,495

In Short: A superior AT compatible with a lot of storage and display options. Very well made—on a par with any same-brand AT.

CIRCLE 468 ON READER SERVICE CARD

senses whether CGA or EGA mode is required, although you can "force" EGA- or CGA-only settings.

The optional Power Graphics Display and board are obviously aimed at heavy graphics users. The combination supports 1,120 by 750 resolution, with 16 colors simultaneously accessible from a palette of 4,096. This power will make a dent not only in your pocketbook but also in your system unit: the board occupies two slots.

Overall, the APC IV is an extremely likable machine. Compatibility is certainly not an issue, because during testing the APC IV handled a healthy sam-

(continued on page 52)



Benchmark Tests: NEC APC IV vs. IBM PC-XT and 8-MHz IBM PC AT

Times given in seconds and decimal seconds.

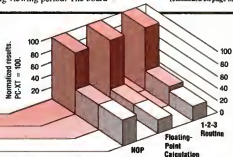
Product	NOP	Floating-Point Calculation	1-2-3 Routine
IBM PC-XT	10.11	155.32	250.00
8-MHz IBM PC AT	4.17	34.41	73.81
NEC APC IV	4.17	34.38	69.22

The 128K NOP benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K loop.

The Floating-Point Calculation benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentials, and logarithmic and trigonometric functions. The test program uses the floating-point library included with Microsoft C 3.0.

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col range 400 times, moves 1,000 cells, deletes 1,000 cells, and then systematically clears the spreadsheet.



Compared to the 8088-based IBM PC-XT, the NEC APC IV is competitive on price and faster on our tests. The NEC races the 8-MHz IBM PC AT to a virtual dead heat.

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CIRCLE 476 ON READER SERVICE CARD

■ PC UPDATE ■ PEGGY GAVAN

Lotus Development Corp. has upgraded *Symphony* from Release 1.01 to 1.2, bringing the integrated program's spreadsheet up to par with 1-2-3. Release 2.01. New *Symphony* functions include linear regression, matrix manipulation, and controlled range input.

The new version runs off a hard disk without the need for a key disk, does *dBASE III* file conversions, and supports Hewlett-Packard Co.'s Laserjet and Laserjet Plus and IBM Corp.'s Page Printer, Proprietary XL, and Quietwriter, Model 2. Communications enhancements include Communications Research Group's *Blast* and CompuServe's B error-checking protocols. Registered owners of *Symphony*, Release 1.1, will receive the upgrade free; owners of Releases 1.0 and 1.01 must pay \$75. Lotus is mailing upgrade forms to registered users; for information call (800) TRADE-UP.

Two weeks after cutting dealer prices on its three basic PC and AT models, IBM slashed direct-sale prices on three original 8088-based PC models by 16 to 22 percent. A 64K-byte PC with no drives now lists for \$1,165, down from \$1,390, and a 256K PC with a single floppy disk drive was reduced from \$1,845 to \$1,445. The list price of the dual-floppy PC is now \$1,595, a reduction of \$400.

Microsoft Windows, Version 1.03, adds drivers for Hewlett-Packard Co.'s Laserjet Plus laser printer, the HP 7550A desktop plotter, the HP ThinkJet printer, and the Xerox 4020 color ink-jet printer. The latest version also features support for the new IBM PC AT keyboard, compatibility with 25 foreign-language keyboards, support of the PostScript typesetting language, and a new version of *Microsoft Windows Paint*, which features a choice of 48 font

company also released Version 2.0 of *HomeBase*, reducing RAM needs from more than 170K to 80K bytes and adding a voice auto-dialer and EGA support. Upgrades are \$29.95, plus \$5 shipping. Brown Bag Software, Campbell, Calif.; (800) 523-0764.

Cordata Technologies (formerly Corona Data Systems) reduced prices on its PC AT-compatible line of desktop and transportable computers by as much as 27 percent. The Model ATD-E-Q with a 1.2-megabyte floppy disk drive and six expansion slots is down \$700, to \$2,900, and the same model with a 20-megabyte hard disk was reduced by \$900, to \$2,795. Cordata's transportable PC with a floppy drive and four expansion slots dropped \$800, to \$2,195, and the same model with a hard disk drive dropped \$1,000, to \$2,895. Cordata Technologies, Thousand Oaks, Calif.; (800) 621-6746.

Diversified Information Services released Version 2.0 of its *AMS Time Machine* project management software. The new version, available on 3½- or 5¼-inch disks, can run with IBM's PC Convertible laptop and compatible laptop machines and offers a data transfer link with Ashton-Tate's *dBASE III Plus*. Upgrades to registered users are free. Diversified Information Services, Studio City, Calif.; (818) 506-7265.

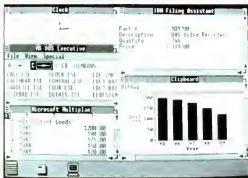
Goldata Computer Services announced two new versions of *Save Our Spreadsheet* (SOS) to run with *Symphony* and later versions of 1-2-3. The price for both versions is \$49.95, and upgrades are free to registered users. Goldata Computer Services, Bryn Mawr, Pa.; (215) 525-1036.

Office Solutions is offering corporate accounts the opportunity to swap their old word processing programs, plus an additional \$50 per package, when they purchase 100 to 500 copies of *OfficeWriter*. Packages that will be accepted for swapping are *MultiMate*, *DisplayWrite 3*, *Sanna Word III*, *WordPerfect*, *Microsoft Word*, *VolksWriter 3*, *WordStar*, and *WordStar 2000*. Call Office Solutions at (800) 228-0747.

Turner Hall Publishing incorporated user-requested features in Version 1.5 of *SQZ*, its data compaction utility for 1-2-3 and *Symphony*. The new version allows all unsqueezed worksheets to be compacted at once and can also be used to compact and expand *VP-Planner* worksheets. Upgrades are free to all registered users. Turner Hall Publishing, Cupertino, Calif.; (408) 253-9607.

Mouse Systems Corp. announced a lifetime warranty covering the company's *PC Mouse* (M-2 and later versions) and the new *PC Mouse Bus* products. Coverage is free for the first year and then \$10 each year thereafter for service and handling. Mouse Systems, Santa Clara, Calif.; (408) 988-0211.

In brief: *VolksWriter Deluxe* has been upgraded to *VolksWriter Deluxe Plus*. It includes a spelling checker and automatic reformatting. Upgrades cost \$45. Lifetree Software, Monterey, Calif.; (408) 373-4718. *NoBlink*, Version 3.3, is not copy protected and can support *WordPerfect*, Version 4.1. Upgrades cost \$20. Nostradamus, Salt Lake City, Utah; (801) 261-0769. Version 3.0 of *Xtrieve* has several new features, including password security and a built-in report-writing option that replaces the standalone package, *Retrieve*. Current *Xtrieve* users can upgrade to Version 3.0 for \$40, and *Retrieve* users can purchase the report writer for \$30. SoftCraft, Austin, Tex.; (512) 258-9983. The *LaserConnection Model ESI-2646* converter now supports the entire Hewlett-Packard Laserjet family on the IBM *DisplayWriter* systems. *LaserConnection* costs \$995. Extended Systems, Boise, Idaho; (208) 322-7163.



Microsoft Corp. has beefed up Microsoft Windows' peripheral support with Version 1.03. This latest release supports Hewlett-Packard's Laserjet printers and plotters.

sizes. Upgrades cost \$25. Microsoft Corp., Redmond, Wash.; (206) 882-8080.

Recently released *Windows Draw*, Version 1.02, and *In-a-Vision*, Version 1.21, support new features of *Microsoft Windows*, Version 1.03, providing access to printers that support the PostScript typesetting language. Micrografx has also bundled eight libraries of clip art with both products. Upgrades cost \$39.95. Micrografx, Richardson, Tex.; (800) 272-3729.

Brown Bag Software has released *Brown Bag Bundle*, a \$129.95 package that bundles its *HomeBase* and *Outline* products with its *Word Processor* and *Mail-Merge*. In addition, Brown Bag introduced Version 4.0 of the *File Recovery System*. The new version is not copy protected and has added blind recovery of erased files. The

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IN

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MaynStream 60Q
internal, available in
60MB model.

MaynStream portable,
available in both
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models.

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*Actual time: 2min/5sec. Total files backed up: 376 consisting of 10,002,432 bytes. Computed on IBM PC with 512K memory and one 10MB hard disk drive. Your actual backup time may vary. IBM PC is a trademark of International Business Machines.

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Business Partners.

Choosing the right business partners can be a delicate task. You want partners that fit your style. Partners that work as hard as you. You want business partners like WordPerfect 4.1, WordPerfect Library and MathPlan.

A best seller.

According to market research firm InfoCorp, WordPerfect 4.1 is now the best-selling word processor for the IBM PC. For good reason. In response to user feedback, WordPerfect has been perfected and re-perfected until it is now unsurpassed in business features and functionality.

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With WordPerfect Library and MathPlan, the best seller now has two unbeatable partners.

Called "almost a must buy" for WordPerfect users (PC Week, June 3, 1986), WordPerfect Library is a comprehensive collection of utilities and functions which make it easy to integrate WordPerfect, MathPlan and other programs. The Library Shell allows you to put multiple programs from WordPerfect Corporation into

memory so you can switch back and forth quickly and easily. The Clipboard lets you move information between programs. The Library also includes a multi-function Calculator, Calendar, File Manager, Macro Editor, Notebook and Program Editor.

MathPlan is the spreadsheet program that is comparable to the number one spreadsheet, with one important plus: compatibility with WordPerfect. MathPlan graphs and charts can be integrated with WordPerfect text—a perfect combination.


Start your partnership.

Get together with three partners that will add corporate strength to your company. WordPerfect 4.1, WordPerfect Library and MathPlan. The perfect business partners. For more information, call or write WordPerfect Corporation, 288 West Center St., Orem, Utah 84057, (801) 227-4000.

Versions also available for
Data General
Features and prices vary.

WordPerfect
CORPORATION

CIRCLE 513 ON READER SERVICE CARD



MathPlan™

WordPerfect 4.1™

WordPerfect Library™

One Year Anniversary
over 12,000 networks installed
Anniversary Sale!
10% discount on all orders thru 12/31/88
(credit card or C.O.D. only)

EasyLAN—Networking For Less Than \$100 Per PC

STOP buying expensive duplicate PC peripherals. Usually your peripherals just sit idle. If your office owns two or more PCs can you justify costly laser printers for each PC? How often are your printers actually busy? Thirty minutes a day? An hour a day? Even your expensive hard disks are used infrequently.

The obvious solution to avoid expensive duplicate peripherals is a local area network that allows you to share printer and disk drives. But until now LANs have cost in excess of \$1,000 per PC.

THE EasyLAN™ OFFICE NETWORK

EasyLAN shares printers and disk drives between IBM PCs. EasyLAN can save you \$1,000 or more per PC by eliminating duplicate equipment purchases.

EasyLAN HIGHLIGHTS

- EasyLAN shares printers, plotters, data, and disk storage
- PC to PC file transfer
- Print spooling
- New PBX support
- Easy to install
- Easy to operate
- Modem support
- Performs in the background

EasyLAN's low price matches the small business user's cost-sensitive budget. It is the office network solution for less than \$100 per PC including cables and software for a 2 PC or 3 PC network.

EasyLAN performs its operations concurrently in the background. EasyLAN communications, file transfers and printer operations all take place while each PC simultaneously performs such normal DOS applications as Lotus 1-2-3™, WordStar™, and dBASE™.

NEW PBX SUPPORT

New PBX support allows EasyLAN to transfer data files and share peripherals between PCs using PBX circuit-switched connections and twisted pair wiring. EasyLAN has already been installed on a number of different PBX systems and has been certified by Northern Telecom on the Meridian SL 1.

EasyLAN's performance meets your small office or department requirements to move word processing documents and spread sheets between PCs. For example, EasyLAN can transfer a 10-page document between PCs as a background operation, in less than one minute.

EasyLAN loads automatically at boot time. It manages the PC's serial and parallel ports for communications and printing.

"The value is high."

—InfoWorld Report Card

Printer sharing operates transparently with existing programs. Print files are automatically spooled to disk and scheduled for printing. Multiple printers per PC may be designated for specific office tasks.

"I bought access to a laser jet printer for \$80."

—CONOCO Oil User

Disk sharing uses EasyLAN's EZCOPY command to move files to and from PCs. ASCII or binary files can be transferred in the foreground, or in the background while other DOS programs run.

All communication operations are protected by a unique password assigned to each PC so security is maintained.



EasyLAN Office Network

EasyLAN SPECIFICATIONS

Each PC in the network requires an individual licensed copy of the EasyLAN program and takes 20k of memory on each satellite PC, a serial port, and DOS 2.0 or above. EasyLAN disks are not copy protected. EasyLAN runs on all IBM PC models and Compatibles. The HUB PC requires a serial port for each satellite PC. The COM2 and COM6 boards are serial port expansion boards which permit you to add serial ports to the HUB PC.

EASY TO INSTALL

EasyLAN can be installed in less time than it takes to enjoy your coffee break. Just plug the EasyLAN cables into existing serial ports. The EasyLAN Network Configuration Program provides a menu driven installation program that will guide you step-by-step through the software installation process.

EASY TO ORDER

EasyLAN is a proven product with over 12,000 installations. To order just call toll free 800/835-1515. Start with a two PC network and expand as your needs demand.

"If it does all you need why spend more? It is the ultimate example of practicality in a local area network."

—PC Magazine

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We take pride in our quality product support. EasyLAN support is provided over the telephone by the same people who installed over 12,000 networks last year.

"I look for products that make my job easier and save my company money. EasyLAN does both."

—Mini Micro Magazine

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Call 408/738-8377

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Item	Description	Price	Qty	Amount
EL 01	EasyLAN Kit— for 2 PCs 30' cable, two disks & manuals	\$179.95	_____	\$ _____
EL 02	EasyLAN Expansion Kit—for 1 PC 30' cable, one disk & manual	\$169.95	_____	\$ _____
EL 11	EasyLAN disk & manual (3 1/4" disk \$89.95)	\$ 79.95	_____	\$ _____
EL 12	EasyLAN 30' cable	\$ 49.95	_____	\$ _____
EL 13	COM2 serial port expansion board, two ports	\$219.95	_____	\$ _____
EL 14	COM6 serial port expansion board, six ports	\$489.95	_____	\$ _____
EL 15	Custom length cables, call for quote		_____	

CA res add applicable sales tax \$ _____
Shipping charge USA \$10.00, \$ _____
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TOTAL ORDER \$ _____

Server Technology, Inc., 1095 East Duane Ave. #103
Sunnyvale, CA 94086 Telex 5106003451

■ NEW ON THE MARKET ■ PAUL M. STAFFORD

Solid-State Bubble Memory Cards introduced by Intel, Bubbl-tec

PCs are finding increasing use in harsh factory environments that are unsuitable for fragile disk-based storage media. So two companies have stepped in with solid-state bubble-memory solutions that replace disks with battery-backed nonvolatile chip storage.

Intel Corp.'s PC-Bubble Card fits into a PC expansion slot. Available in 512K-byte (Model IPCB-75-1, \$495) and 1-megabyte (Model IPCB-75-2, \$945) versions, the PC-Bubble

Card is rated to withstand temperatures ranging from 0° to 60° Celsius and shocks up to 5Gs during operation and 50Gs in nonoperational mode.

Bubbl-tec offers a uniquely flexible bubble-memory alternative in the form of the \$1,199 model BDH-1 Bubbl-Dek, which mounts in a full-height 5½-inch drive bay and provides two half-height 128K-byte Bubbl-Pac bubble-cassette (\$175 each) storage drives. A half-length controller card provides a ROM BIOS extension that lets the PC boot directly from the Bubbl-Pac, and the

Bubbl-tec's \$1,199 Bubbl-Dek plugs two half-height 128K-byte removable bubble-memory cartridges into a drive bay in the PC.



system is rated for temperatures between -40° and 80° Celsius.

List Price: PC-Bubble Card, Model IPCB-75-1, \$495; Model



IPCB-75-2, \$945. Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95052-8065; (916) 351-2746.

CIRCLE 446 ON READER SERVICE CARD

Lithium Battery Replaces Burned-Out PC AT Clock, Configuration Battery

The battery that backs up your AT's automatic clock and configuration information is rated for an average life of about 3 years. Ever wonder what you'll do when it burns out? International Battery Corp. offers an answer in the form of its \$27.50 Tadiran replacement battery. The battery has a shelf life of 10 years and comes with a 3-year in-use warranty.

List Price: Tadiran, \$27.50. International Battery Corp., 6860 Canby Ave., #113, Redwood City, CA 94061; (818) 609-0516.

CIRCLE 448 ON READER SERVICE CARD

LAN Interface Card Runs At High Clock Speeds of Fast AT Compatibles

Local area network interface cards especially have experienced reported incompatibilities with the faster machines that have recently become available. Vestra-Subco claims that its \$495 Arc-Card runs with all the faster machines. It runs Novell's Advanced NetWare operating system and can drive up to 2,000 feet of RG-62/U coaxial cable.

List Price: Arc-Card, \$495. Vestra-Subco Inc., 1402 W. Adams Ave., Temple, TX 76701; (817) 771-2124.

CIRCLE 449 ON READER SERVICE CARD

HOT PROSPECT

Video 7 Vega Deluxe Card Takes EGA to New Heights of Resolution

Video 7, whose Vega was the first EGA-compatible graphics card, now offers the \$599 Vega Deluxe, an EGA-compatible card optimized to take advantage of NEC's Multisynch monitor.

Standard EGA resolution is 640 by 350 pixels, but the Vega Deluxe can also combine with the Multisynch to produce 640 by 480 and 752 by 410 text and graphics. Software included with the card enables it to switch automatically into the higher-resolution modes and to

execute bootable CGA-compatible games.

The Microsoft Windows graphics-based operating environment also comes bundled with the Vega Deluxe, including drivers to let it use the high-resolution modes. The price of the original Vega card has been reduced from \$599 to \$549.

List Price: Vega Deluxe, \$599. Video 7 Inc., 550 Sycamore Dr., Milpitas, CA 94025; (408) 943-0101.

CIRCLE 450 ON READER SERVICE CARD



Video 7's \$599 Vega Deluxe is an EGA-compatible graphics card that offers 752 by 410 resolution with NEC's Multisynch monitor and Microsoft Windows.

Amdek Ships Flat-Screen Monochrome Monitor in Green, White, and Amber

If you're in the market for a monochrome monitor, Amdek Corp. gives you a choice of colors. Its Video 410-series monitors come in green (Model 410G, \$240), amber (Model 410A, \$250), and white (Model 410W, \$250). All feature a technique Amdek calls "dynamic focus" and flat-screen design. Amdek includes a nylon-mesh antiglare filter in the deal and will also throw in a tilt/swivel stand for an extra \$29.

List Price: Model 410G, \$240; Models 410A and 410W, \$250. Amdek Corp., 2201 Lively Blvd., Elk Grove Village, IL 60007; (312) 364-1180.

CIRCLE 451 ON READER SERVICE CARD

Format Translators Read Apple and CP/M Disks, Run CP/M Programs on PC

MicroSolutions has introduced two programs that solve operating system compatibility problems by letting you use programs and data from other computers on PCs. *UniDOS*, which retails for \$69.95, is a memory-resident program that emulates a Z80 microprocessor and creates a CP/M-compatible

DEC Makes DOS Link: VAXmate 80286 PC Has Built-in Networking

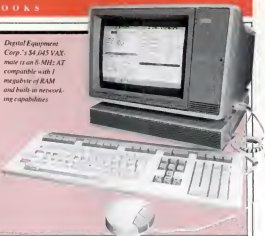
Digital Equipment Corp.'s efforts in the PC-compatible market have heretofore been restricted to the Rainbow, a semicompatible. In a new approach based on linking PCs to its VAX and MicroVAX architecture, DEC is featuring the \$4,045 VAXmate, an 8-MHz 80286-based AT compatible with built-in networking, as well as 1-megabyte of RAM, an integrated monochrome graphics monitor, a 1.2-megabyte floppy drive, and a mouse.

Communications support consists of an RS-423 serial port and a ThinWire EtherNet connection. The monitor supports DEC graphics modes of up to 800- by 250-pixel resolution, and the floppy drive can also read and write to DEC's 400K-byte RX50-format disks.

List Price: VAXmate, \$4,045. Digital Equipment Corp., Maynard, MA 01754-2571; contact your local DEC representative

CIRCLE 455 ON READER SERVICE CARD

Digital Equipment Corp.'s \$4,045 VAXmate is an 8-MHz AT compatible with 1 megabyte of RAM and built-in networking capabilities.



environment for running 8-bit CP/M software.

Matchpoint-PC, at \$195, consists of a plug-in card and software and lets PC users read from and write to Apple II disk formats, such as Apple DOS, ProDOS, SOS, and Apple CP/M. The package also includes *UniForm-PC*, which permits the use of 110 disk for-

mat on a PC or XT and 160 formats on an AT.

List Price: *UniDOS*, \$69.95; *Matchpoint-PC*, \$195. **Requires:** 128K RAM, *UniDOS*, *Matchpoint-PC*, DOS 2.0 or later. MicroSolutions Inc., Software Division, 125 S. 4th St., DeKalb, IL 60115; (815) 756-3411.

CIRCLE 452 ON READER SERVICE CARD

PC Desktop Publishing Software Offers WYSIWYG, Typesetting Features

MegaHaus Corp. has introduced *First Impression*, a \$695 program that brings WYSIWYG desktop-publishing capabilities to the PC. *First Impression* uses a library of style sheets to control layout, supports Adobe Systems' PostScript page-

description language, and can integrate text and graphics on one screen.

First Impression can also import text and graphics from *WordStar*, *MultiMate*, *WordPerfect*, *DisplayWrite*, 1-2-3, *AutoCAD*, and *PC Paintbrush*, as well as images scanned by *Datascopy* scanners.

List Price: *First Impression*, \$695. **Requires:** 512K RAM; hard disk drive; Hercules, CGA, or EGA compatible or \$1,795 MDA Genius graphics display; DOS 2.1 or later. MegaHaus Corp., 5703 Oberlin Dr., San Diego, CA 92121; (619) 450-1230.

CIRCLE 453 ON READER SERVICE CARD

Sperry Rolls Out Compact 8-MHz 80286-Based Machine: PC/MicroT Uses VLSI, Surface-Mount Technology

What IBM hath wrought, compatible makers keep improving upon. **Sperry Corp.**, in the process of completing its merger with **Burroughs Corp.**, is taking advantage of very large-scale integration (VLSI) and surface-mount technology in bringing a small-footprint AT compatible to market. With a base price of \$2,345, its **PC/MicroT** features an 8-MHz 80286 microprocessor, 512K bytes of RAM (expandable to 1.5 megabytes using a \$108 daughter-board plus RAM chips), parallel and serial ports, and five full-length expansion slots (two 8-bit and three 16-bit) in a 15- by 15-inch footprint. An extra \$1,245 buys a 20-megabyte hard disk.

List Price: **PC/MicroT**, \$2,345; with 20-megabyte hard disk, \$3,590; 1-megabyte RAM card, \$108. Sperry Corp., Blue Bell, PA 19424-0031; (215) 542-4213.

CIRCLE 456 ON READER SERVICE CARD



Sperry Corp.'s \$2,345 **PC/MicroT** is an 8-MHz AT compatible that measures only 15 by 15 by 5 inches.

Lifetree Revives Popular Word Processor: Volkswriter Deluxe Plus

Lifetree Software, the creator of the *Volkswriter* series of word processors, has brought back an enhanced earlier member of the line whose flagship product is now its \$295 *Volkswriter 3*. *Volkswriter Deluxe Plus*, at \$99, resembles the discontinued *Volkswriter Deluxe* but includes new features like a 100,000-word spelling checker, automatic reformatting, a form-letter facility, and a notepad.

List Price: *Volkswriter Deluxe Plus*, \$99. **Requires:** 256K RAM, DOS 2.0 or later. Lifetree Software Inc., 411 Pacific St., Monterey, CA 93940; (408) 373-4718.

CIRCLE 454 ON READER SERVICE CARD

The PhD: Crash-Proof Removable Hard Disk

PC FIRST LOOK

BY WINN L. ROSCH

For folks who buy hard disk subsystems by the pound, the Bernoulli Box has new competition. At over 36 pounds, the Amcdyne PhD (Perfect Hard Disk) system is a heavyweight that boasts many of the same advantages as the Bernoulli, including crash-proof storage and removable 20-megabyte disk cartridges.

Only the concept is the same, though. The PhD uses conventional hard disk technology and includes a 60-megabyte fixed disk with its 20-megabyte removable drive. PhD cartridges are shorter and thicker than Bernoulli cartridges—and they don't wear out.

The 80-megabyte PhD's installation software divides the system's capacity into four vir-

tual drives of 20 megabytes each (extracting three volumes from the 60-megabyte drive—the last one being the removable cartridge).

Amcdyne employs a bevy of engineering innovations: a



At more than 36 pounds, the Amcdyne PhD system has a poor bytes-per-ounce ratio, but it offers a crash-proof technology and disk portability.

low-mass Whitney head instead of the heavier, older Winchester style; a patented anti-bead-crash mechanism (the drive must spin up before the head loads); an SCSI (small computer system interface) connection; one-to-one sector interleaving; full track buffering; and a single spindle (motor and drive shaft) that powers both the fixed disks and the removable cartridge.

The system proved slow writing large files. All four virtual drives ran the PC Magazine Labs Big-file benchmark test rheumatically, taking nearly 6 minutes to write 10 million bytes. Many medium-priced disks are four times faster!

Its performance with the PC Labs Scatter benchmark test (which measures average access time by writing an elaborate directory structure) revealed a reasonably fast access time, about on par with the 25 milliseconds Amcdyne claims.

But the PhD is noisy, and its cartridge system is unusually inconvenient. Because all disks share the same spindle, the whole system must be stopped

to change cartridges.

That all the drives share a common spindle also means that all depend on one motor and servo system. If that fails, so does everything—including the cartridge backup system.

I don't question the sturdiness of the PhD, but, for all of its promise and its price, it really delivers very little. ■

PC FACT FILE

PhD

Amcdyne Inc.
1301 S. Sunset St.
Longmont, CO 80501
(800) 262-6743
(303) 772-2601
List Price: \$6,995; cartridges, \$175
Requires: DOS 3.1 or later.
In Short: A very sturdy hard disk with built-in removable cartridge backup. Offers fast data access but slow transfer.

CIRCLE 428 ON READER SERVICE CARD

PGC Resolution on an EGA-Priced Board

PC FIRST LOOK

BY GLENN HART

EGA clones seem to be springing up everywhere like weeds. What sets an EGA-type board apart from the pack?

Full EGA, CGA, MDA, and Hercules emulation? No, others deliver this. Well, try this: how about a parallel port and resolution equal to IBM's Professional Graphics Controller (PGC) for only a few bucks more than a

run-of-the-mill EGA clone?

Tseng Laboratories' Eva/480 is the first of a new wave of boards that goes beyond the EGA's 640-dot by 350-line resolution. At present, these boards reach their full potential only when running with the NEC MultiSync monitor (see box). The Eva/480 and other PGC-quality boards run on many high-resolution monitors up to the limits of the display's resolution (generally 640 by 350 or 400).

The Eva/480 is a full-length card with a small daughter-board, called the CMII, which provides CGA, MDA, and Hercules emulations. It includes an RCA video output.

The Eva/480 comes with a disk chock full of support software, among which are utilities that let you change screen lengths to a 132-column by 25-, 28- or 44-row mode; a replacement for ANSI.SYS that supports these extra video modes; a good print spooler; programs to enable or disable CGA and Hercules emulation; and a set of programs to create, edit, and install custom screen fonts.

Drivers for the 640 by 480 high-resolution mode are included for *Microsoft Windows*, *1-2-3*, and *AutoCAD*. There is also a copy of the *Dr. Halo II* painting program optimized for either normal EGA or the 640 by 480 mode.

Our tests of the standard EGA mode were uneventful: every EGA-compatible program we tried worked perfectly. CGA and Hercules emulation

PC FACT FILE

Eva/480

Tseng Laboratories Inc.
Newtown Industrial Commons
205 Phensant Run
Newtown, PA 18940
(215) 968-0502
List Price: \$680
Requires: NEC MultiSync or equivalent monitor.
In Short: A superb EGA card with EGA, CGA, MDA, and Hercules emulation and 640-dot by 480-line graphics.

CIRCLE 427 ON READER SERVICE CARD

functioned as promised, too. Moreover, the 640 by 480 mode noticeably reduces jaggies in *Windows*, *AutoCAD*, and *Dr. Halo*.

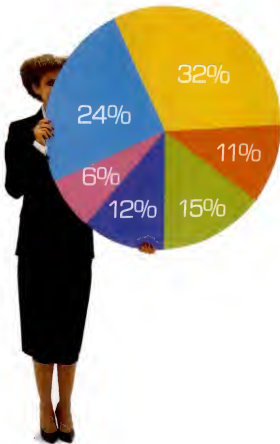
Tseng has priced the Eva/480 at \$680; the company's standard Eva board (more or less an ordinary EGA clone) is \$525, plus \$50 for the CMII, so the Eva/480's sharper resolution comes to only \$105 more. ■

NEC's Hot Monitor

"I've never seen a fairly expensive monitor take off like this," said one retailer in describing NEC's top-selling JC-1401P3A MultiSync monitor. Compatible with any standard PC graphics

card up to a resolution of 800 dots by 560 lines, it auto-adjusts to any bandwidth between 15.5 and 35 kHz.

Sales are doubling each month, and NEC has had to expand its plant to meet the demand.—J. Matzkin



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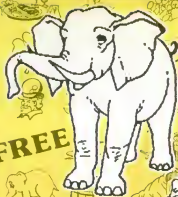
your local DCA distributor or dealer or call us direct at 1-800-241-IRMA. EXT. 518

dca

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CIRCLE 188 ON READER SERVICE CARD

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HOW IT WORKS

Each folder contains about 100 professionally-drawn pictures. To use ART FOLDERS you need FONTASY Version 2, an IBM PC, XT, AT or true compatible with 256K of memory (512-640 recommended for full page composition), an IBM or Hercules graphics board, and a dot matrix or HP LaserJet printer. Browse through ART FOLDER pictures, choose the ones you like, and make them bigger or smaller. Then, combine them with FONTASY's superb typefaces to produce stunning, custom visuals in minutes. For more information on FONTASY, please see back issues of this magazine or call us for a free catalog.

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Tate, and Lotus Development Corp., respectively

CIRCLE 394 ON READER SERVICE CARD

■ COMMUNIQUÉS ■ EDITED BY BILL HOWARD

Spreadsheet Retirement Plan

If you can get a friend to try your copy of *PC-NyPlan*, a "shareware spreadsheet/decision support system" for PCs from *NyPlan* (12515 Willows Rd. NE, Kirkland, WA 98034), you'll

be on the road to Easy Street. If you're a registered user (\$75) and someone else registers a copy of *NyPlan* that you gave them (another \$75), you get a \$15 commission.

The pyramid payments continue on a reduced scale for registered copies of your copies.

Computer Personals

Single disk drive (SIF-32) seeks floppy, ready for formatting. Well-developed menus, super-megabyte memory, and the ability to manipulate files. Let's run utilities. —*Personals* ed in *The Learning Annex's September 1986 course catalogue*

Some Soft Music, a Little Wine, and the Warm Glow of Your Favorite Spreadsheet . . .

Button passed out by Zenith at a computer-graphics trade show to promote the company's reduced-glare flat-tension mask (FTM) monitor technology: *Do it with the lights on.*

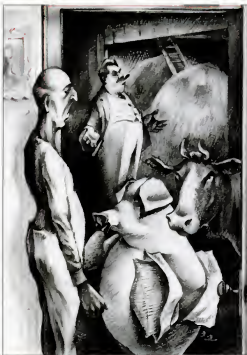
Yet Another Reason Why Young People Prefer PCs to Mainframes

Ad in *The Chicago Tribune* classifieds:

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Contributors to this issue: Paula Berman, Vincent Puglia, and William Grosse.

**Joke of the Week**

As told by venture-capitalist Ben Rosen:

Three travelers—a Hindu, a Jew, and a high-tech venture capitalist—seek shelter from a storm at a remote farmhouse. The farmer and his wife agree to put the three up for the night, if they're willing to sleep in the barn.

Shortly after retiring, the farmer hears a knock at his door. It's the Hindu, who asks, "Would you mind if I stay inside the farmhouse? It would be unseemly to sleep in the same building as a cow."

A few minutes later, the farmer is awakened again. Standing outside the door is the Jewish traveler who says, "I feel uncomfortable sleeping in the barn with a pig. Would it be possible for me to sleep in the farmhouse, too?"

The farmer has no sooner fallen asleep when he hears an insistent knock again.

"Who was it this time?" the farmer's wife asks when he returns.

"It was the cow and the pig."

Open Access

(continued from page 51)

in the middle of the paragraph. The next sentence started on the next line but had an extra space at its start. This unintentional indent appeared on the screen and in the final document—an unacceptable flaw for a professional-quality word processor. A Software Products International representative said that the company was aware of this problem and was reviewing it.

Open Access II has more than enough features, but far too little useful integration. If you need center primarily on multiple database applications and a programming language and you need the other modules infrequently, then you may want to give this program a look. Otherwise, it is not the bargain that its price might lead you to believe, and you should be able to get more useful capabilities for your money from other alternatives.

NEC APC IV

(continued from page 36)

pling of business and recreational programs with ease.

In fact, there's really nothing wrong with the APC IV. I just wish NEC had gone a little further in a few areas with the machine. For example, 8 MHz, while comparable to offerings from IBM, Texas Instruments, and others, no longer constitutes breathtaking performance for an AT. And the NEC-manu-

factured hard disk, rated for a 40-millisecond average access time, is not as fast as some of the super-high-performance models that are currently available.

Apart from these petty gripes, though, the APC IV is a most desirable machine. It's not the cheapest machine around, but it is price competitive with ATs from other major manufacturers. It is muscular, stylish, very classy, and certainly on at least an equal footing with any other AT.

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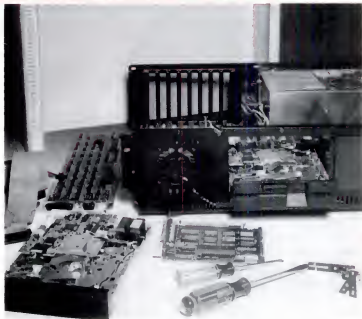
John Atma, Chief Technician
for Tech Personal Computers

"After viewing PC TechVideo, I now understand the basics of how my computer works and was even able to replace the 1.2M drive on my AT at work. PC TechVideo was definitely worth the money."

Brenda Hudson, Data entry and processor
for Sark Enterprises

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Gita Beant, Economics major
at UC Irvine



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The Core HC150: Fastest AT Hard Disk Alive?

PC HANDS ON

BY WINN L. ROSCH

The fastest hard disk you can plug into your AT—that's Core International's immodest claim for its newly improved HC150 Hard Disk system. With a formatted capacity of roughly 150 megabytes, the HC150 is a tempting hunk of hardware for high-performance 80286-based systems and especially for the 80386-based prototypes it's rumored to inhabit.

Every component of the HC150 conspires to push performance to the limits. The drive itself is a Control Data Corp. unit with a servo-voice, coil head actuator that scores an average access time of about 16 milliseconds—the lowest ever in the PC family.

Fast Data Transfer

The HC150 uses the ESDI (Enhanced Small Device Interface) connection standard, which improves the speed at which large blocks of data can be moved to and from the disk. Its rated data transfer speed is 10

Core's 150-megabyte hard disk accesses data at a blistering 16 milliseconds, thanks to the combination of a 10-MHz ESDI data transfer rate and 1-to-1 sector interleave.

MHz, twice that of the ST506 interface in other AT drives.

To connect the ESDI drive with the host AT, Core uses a Scientific Micro Systems OMTI 8000-series controller. Although the test unit had only the ESDI interface available, other Core controllers can directly substitute for the standard AT controller, which can control both floppy and hard disks (either ESDI or ST506 models).

Further speed gains come from the use of a 1-to-1 sector interleave, instead of the standard factor of 3 to 1. This formatting refinement lets a full disk track be read in a single disk revolution instead of the three spins required with the standard AT controller.

Benchmark Results

Does it work? I was skeptical

about using the de facto industry standard disk performance benchmark tests that Core wrote. Instead, I tried two PC Magazine Labs backup benchmark tests that more accurately reflect real-life performance: the Big-file Backup benchmark test times writing a 10-megabyte file to disk and is a good measure of data transfer rate; the Scatter Backup benchmark test builds an elaborate hierarchy of 1,578 subdirectories with two files in each and indicates average access time.

The results were awesome. The HC150 took 40.8 seconds to write the Big-file test (a 9-MHz AT with an AT-rated Seagate ST506 required 88.97 seconds). For the Scatter test, the HC150 took 28 minutes, 58.5 seconds (compared to 44 minutes, 40.74 seconds for the Sea-



PC FACT FILE

HC150 Hard Disk

Core International
7171 N. Federal Hwy.
Boca Raton, FL 33431
(305) 997-6055

List Price: HC150 drive only, \$5,995; ESDI controller, \$795 with floppy controller; \$695 without floppy section.

Requires: IBM PC AT or compatible; ESDI controller; DOS 3.0 or later.

In Short: Literally the fastest drive available for the AT—twice as fast at moving data as conventional drives and 1.5 times faster at seeking random bytes—all coupled with cavernous 150-Mbyte capacity and full DOS compatibility.

CIRCLE 421 ON READER SERVICE CARD

gate unit).

In other words, the new HC150 is more than twice as fast at moving data and 1.5 times faster at finding it than conventional AT drives. Add Gigafile software (which lets you create larger-than-32-megabyte disk volumes), automatic park-and-lock, and its overall ruggedness, and the Core HC150 is a very impressive package indeed.

PrintQ Juggles Jobs

PC HANDS ON

BY HOWARD MARKS

Into the glut of PC print spoolers, Software Directions has thrust *PrintQ*, a mainframe-style print spooler that may live up to its billing as the Rolls-Royce of print spoolers. If you use several types of forms, *PrintQ* can save you time and effort.

You probably already have at least two print spoolers: DOS's PRINT.COM and the spooler that came with a multifunction card. But *PrintQ* is more than a print buffer. It lets you change the priority of print jobs, print

multiple copies, keep a job in a queue after printing, and manage two printers.

PrintQ works like this: It traps all characters that are sent to the printer and stores them in a print job file on disk. You have the option of printing now or later; in either case, *PrintQ* stores the data. After a job is finished, the portion of the file taken up by that job is deleted. Formatting codes are saved so that the file will print later without the program that created it (spreadsheets, for example, will print after you quit 1-2-3).

Pressing Ctrl-Alt-P brings up a screen showing all the jobs in the queue and their printing pa-

rameters.

Prints in Batches

PrintQ groups job files for each form together to minimize the number of times you have to change paper. You can hold all the jobs that need checks or wide paper until the end of the day and print them as a batch. *PrintQ* also helps you align the forms in the printer before you start printing and lets you reprint a job starting at any page if the printer jams.

PrintQ is without a doubt the most sophisticated print spooler for the PC I've seen, and it compares favorably with spoolers included with leading local area

networks. If you use multiple forms, share a printer, or want better control over your printer, *PrintQ* will quickly repay its \$89 list price.

PC FACT FILE

PrintQ

Software Directions
1572 Sussex Tpke.
Randolph, NJ 07869
(201) 584-8466

List Price: \$89
Requires: 35K RAM, DOS 2.0 or later.

In Short: Creates queues of files for the printer that can be easily manipulated. Not copy protected.

CIRCLE 422 ON READER SERVICE CARD

No other video adapter revs up as much software, drives as many monitors, or fine tunes as many graphics.

STB Systems has just combined the technology of the industry's five most popular video display adapters: the IBM Color Graphics and Monochrome/Printer Adapters, the Hercules Graphics Card™, the Tseng UltraPAK-S™, and the STB Chauffeur™.

With the new Chauffeur HT™, the world's best graphics capabilities are at your service.

Roll through any software.

The Chauffeur HT lets you use any and all standard CGA or MGA compatible software. No preboot software or special drivers are needed.

Drive a fleet of monitors.

With The Chauffeur HT, you can emulate any color graphics software, producing 16 shades of gray on any IBM compatible monochrome monitor. CGA 200 line graphics modes are expanded to a full-screen format. Text is displayed as high resolution 8 X 14 characters.

The Chauffeur HT displays Hercules compatible software at 720 X 348; it provides a 1024 X 348 display mode for the CAD/CAM market, and a crisp 132 column display for spreadsheet and terminal emulation users.

Using any standard RGB color monitor or Enhanced Graphics display, you can produce monochrome quality text while maintaining high resolution, 16 color graphics. Even Hercules compatible software can be produced on enhanced monitors.

Enjoy the extras.

In addition to giving you greater graphics capabilities on a wider range of monitor types, with a wider selection of software,

The Chauffeur HT gives you a standard parallel printer port, an optional clock/calendar, a light pen interface support, PC Accelerator software, and full compatibility with the IBM PC, XT and AT.

	IBM Color GT	IBM Color	IBM Color Monochrome	IBM Color Monochrome	IBM Color Monochrome
Enhanced Graphics Display	Yes				
RGB Color Display		Yes	Yes		
Resolution Display	Yes	Yes	Yes	Yes	Yes
16 Bit Display	Yes				
IBM Hercules Display	Yes	Yes	Yes	Yes	Yes
IBM CGA	Yes	Yes	Yes	Yes	Yes
Hercules Hercules Graphics	Yes		Yes	Yes	Yes
IBM Color Display	Yes	Yes	Yes	Yes	Yes
Parallel Printer Port	Yes	Yes	Yes	Yes	Yes
IBM AT CGA MGA Hercules Compatible Software (See driver support)	Yes				
Clock/Calendar	Optional	Optional	Yes		

Honk for more information.

For detailed information on The Chauffeur HT, call or write STB Systems, Inc., 601 North Glenville, Richardson, Texas, 75081. (214) 234-8750.

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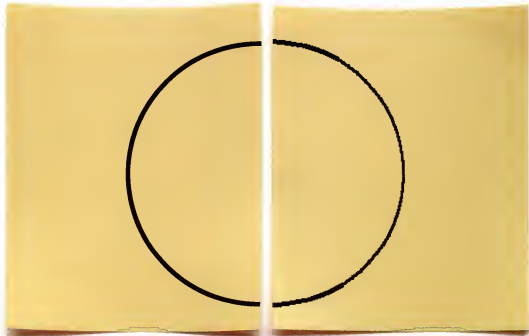
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QuadLaser looks better than the competition. Here's why:

With QuadLaser, circles look like circles, not jagged lines. And solid areas look black, not dull gray.

BLACK!

BLACK?

QuadLaser looks better than the competition because QuadLaser comes with 2 megabytes of memory. That means you get sharp, crisp images every time.

Plus QuadLaser comes with 70 type fonts which can be printed in portrait and landscape. And to ensure full software compatibility QuadLaser emulates Epson, Qume, and HP LaserJet printers.

Epson is a registered trademark of Epson America, Inc. Qume is a registered trademark of Qume Corp., a subsidiary of ITT. HP and HP LaserJet are registered trademarks of Hewlett Packard.

QuadLaser lasts longer than the competition. Here's why:

QuadLaser's durable design supports a 10,000 page per month duty cycle and a 600,000 page engine life.

That's over three times better than the competition's promise of only 180,000 pages.

For increased productivity, QuadLaser features 8 original pages per minute printing, 250 sheet input and output capacity, face down collating, and over 500K of buffer space.

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XyQuest, Inc.
3 Loomis Street, Bedford, MA 01730
CIRCLE 518 ON READER SERVICE CARD



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with a Pinwriter P5XL printer

Fast, black letter-quality printing will be the primary reason many people will buy a P5XL printer. But there are plenty of other good reasons. In fact, it's the most versatile printer ever created for personal computers.

It can use an optional ribbon to print seven other colors plus black. And it has the best graphics resolution of any impact printer you can buy, due in part to our advanced 24-pin printhead. Plus it can print more type faces automatically than any other dot matrix printer. And it's quiet and fast.

You can also expect a P5XL printer to turn out millions of characters before it will need service because it has the highest reliability rating in the industry. And there's a nationwide network of NEC Customer Service Centers to take care of maintenance.

Now, while the Pinwriter P5XL performs a little black magic, you won't have to go in the red to buy it.

The Pinwriter P5XL is the latest addition to the most advanced and extensive family of 24-pin printers available. See it at your dealer or for an information package that includes actual print samples, call 1-800-343-4418 (in MA 617-264-8635). Or write: NEC Information Systems, Dept. 1610, 1414 Massachusetts Ave., Boxborough, MA 01719.

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NEC
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CIRCLE 345 ON READER SERVICE CARD

Cubit: Memory-Resident File-Compression Utility

BY CHRISTOPHER BARR

Most people would like more room to store files and would rather not spring for the cost of a bigger hard disk. *Cubit*, from SoftLogic Solutions, is a RAM-resident program that painlessly gains you extra storage space for a lot less than the cost of a new hard disk.

Cubit is most effective when compressing English-based ASCII text, though it will work on most types of files. Some of the compression techniques used are dictionary, string, digraph, and run length. *Cubit* will attempt to compact any file, but in some cases the compression process will actually make the file larger, in which case *Cubit* is programmed to leave the file untouched (I couldn't get it to shrink a particular 1-2-3 spreadsheet). SoftLogic Solutions is developing an upgrade (free to registered users) that will also effectively compress binary files.

Cubit produces favorable results, but not quite the reduc-



If you want to specify a file to be compressed manually, a window drops down, and *Cubit* then accepts commands to compress, expand, or check a file.

tions claimed by the maker—except for ASCII text files. Text files comprised of telephone numbers and text averaged a 24 percent reduction. *dBASE* files were cut down by 36 percent, while 1-2-3 .WKS and .WK1 worksheets showed only a 10 percent drop on the average, and some were not reduced at all. *WordStar* files, which have their own format, were cut by an

average of 40 percent. ASCII text files, however, written in good old-fashioned English, showed the largest reduction: 64 percent.

You can put *Cubit* into your AUTOEXEC.BAT file, and it will remain RAM resident. It will not compress or extract files indiscriminately, however—it works only on files that you had already compacted

PC FACT FILE

Cubit

SoftLogic Solutions Inc.
530 Chestnut St.
Manchester, NH 03101
(603) 644-5555
List Price: \$49.95

Requires: 128K RAM, DOS 2.0 or later.

In Short: A memory-resident utility for compressing text files. Copy protected. (An unprotected version is available for registered users.)

CIRCLE 696 ON READER SERVICE CARD

manually. When *Cubit* is RAM resident, it will intercept compressed files and decompress them for use automatically. If you are working with an expanded file and you save it under another name, *Cubit* will not recognize the new file but will recompress the old version.

Installation is simple enough, and the manual is clear and well written. The directions suggest that before installing *Cubit*, you remove all other memory-resident utilities as well as any RAMdisks. Software such as *SideKick* can then be used in tandem with *Cubit* without any problem.

Fast Talkers: A Pair of 2,400-bps Modems

BY PHIL WISWELL

The Quadram Communications Group and IDEAssociates have entered the fast lane of micro-computer telecommunications with internal modems and bundled software that let you exchange data at speeds of 300, 1,200, and—whoo, boy—2,400 bits per second. As modems and indeed most hardware should, both the IDEAcomm 2400 and the Quadmodem II operate in a way that is transparent to the user. What users see is the software, and that is the main differ-

ence between these two units.

The IDEAcomm 2400 is a full-length board. Its default serial port is COM1, and you can set it for COM2, COM3, or COM4—if you can find the DIP switches. The manual says you can see and change them through a small square hole in the faceplate so that you don't have to remove the PC's cover after installation. On the model I tested, though, the switches were in a less convenient position in the middle of the board.

The IDEAcomm communications software is very clearly

presented: menus make the modem's operation nearly hassle-free, and experienced users who feel restrained by menus can use a command-line interface to save time. Either way, a good series of context-sensitive help screens is always available for quick reference.

IDEAcomm has some nice

Like the
IDEAcomm 2400,
the Quadmodem II
is compatible
with the Hayes
command set.

features. The program provides toggle switches for the printer, password security, a file log, auto-answer, and unattended operation (which allows other users to call, leave messages, and send/receive files in your absence). IDEAcomm also lets you exit to DOS in the middle of an on-line session, perform a DOS chore, or run a program, and return on-line without missing a beat.

A Half-Length Board

Like the IDEAcomm 2400, the Quadmodem II is fully compatible with the Hayes protocol, but it comes with Microstar's *CrossTalk* XVI. The Quadmodem II is half-length, so it

(continues)

2,400-bps Modems

(continued)

fits into short slots.

Installing the Quadmodem II is similar to installing the IDEAcom 2400, although it uses less-convenient jumper pins rather than DIP switches to set the COM port. Clear diagrams facilitate jumping the proper sets of pins, however.

I've never been a fan of *Crosstalk XVI*, but I admire its use of script files. These make it simple even for a beginner to set up files that automatically dial and log on to other computers or database services. After checking the default parameters, I used this tool to create two files: one to dial a friend's computer and another to dial and log on to MCI Mail through Tymnet.

As modems, the IDEAcom 2400 and the Quadmodem II are evenly matched. The rest of the story depends on what software you plan to use. Out of the box, IDEAssociates' combination of board and software is my choice.

PC FACT FILE

IDEAcom 2400
IDEAssociates Inc.
35 Dunham Rd.
Billerica, MA 01821
(617) 663-6878
List Price: \$695
Requires: 250K RAM, DOS 1.1 or later.
In Short: Full-slot 2,400 bps Hayes-compatible internal modem, IDEAcom software.

CIRCLE 635 ON READER SERVICE CARD

Quadmodem II
Asher Technologies Inc.
The Quadram Communications Group
1009 Mansell Rd.
Roswell, GA 30076
(800) 334-9339
List Price: \$695
Requires: 96K RAM, DOS 1.1 or later.

In Short: Half-slot 2,400 bps Hayes-compatible internal modem, *Crosstalk XVI*.

CIRCLE 634 ON READER SERVICE CARD

Namer Names Names—for Anything

BY CHRISTOPHER JOHNSTON

It seems like nearly every product in the computer industry is named "hard" this or "soft" that. In a market clogged with technical acronyms, creative words get overused to death (like the word *turbo*) and then become as confusing and boring as the technical acronyms. But now there's *Namer*, a title and word generator from The Salinon Corp. that gives product naming a whole new ring. It's nutrefrisk and easirock, has pelizest with mutosave, and comes without necrajunge.

Namer follows three different paths to generating names. One is by randomly matching pronounceable morphemes to produce words not (yet) in the English language. Another is by combining words or word parts that already make sense alone but imply something new when put together. The third method generates a phrase by describing a particular company or service.

There are 11 means to that end in *Namer*, but the most useful ones include the original name generator, which makes pronounceable words; the connotation synthesizer, which lets you choose what you want a word to suggest (such as hi-tech, powerful, or new); and the adaptive learning technique, which offers generated words for you to rate. This way, the program can concentrate on generating words like the ones you've rated highly. The phrase-making and the palindrome (words that are spelled alike backwards and forwards, like *radar*) tools are useful, too. If none of these generate sparkling results, *Namer* also comes equipped with alphabetical lists of animal, product, and people names.

Once *Namer* is fired up, it automatically generates names on the screen at approximately 1-second intervals. When you like one of the words *Namer* generates (about every tenth one is really good), it can either be

printed or put into a save buffer. Later the save buffer can be printed as well. In addition, *Namer* can echo all the monikers to the printer.

Namer is a dream come true for people whose creative juices seem to have dried up. The program itself is easy to use but elegant. For instance, the Esc key is often used to begin name-generation procedures instead of to end them. Also, it could use little touches like color support, which shouldn't be hard to add. These are minor complaints though; *Namer's* utility far outweighs its cosmetic deficiencies. One thing I already like is that although *Namer* isn't copy protected, Salinon pro-

PC FACT FILE

Namer, Version 1.2
The Salinon Corp.
7430 Greenville Ave.
Dallas, TX 75231
(214) 692-9091
List Price: \$235

Requires: 256K RAM, DOS 2.1 or later.

In Short: Generates names for companies, products, children, or anything else by combining Latin or Greek word roots in interesting ways. Not copy protected.

CIRCLE 633 ON READER SERVICE CARD

vides backup disks anyway. That shows the company cares for its customers.

NAME BY SALINON : Name for the Examination of Name Lists

LISTS AVAILABLE	RETRIEVAL OPTIONS
0 - Services and Products	Display names in alphabetical order.
C - Companies	Start with the letter: P
B - Boys	Display names only of a certain class.
G - Girls	Names must be at least 1 letter long.
P - Pets	but no longer than 15 letters.
B - Base Games and Colors	Display names only containing the following
T - Timers	sequence of letters: ALL LETTERS
A - Animals	
Please enter letter: P	

To use this option please enter a string of letters and then press Enter: **0-2**
Press Esc to begin name display **F10 Main Menu**

F1 Help

NAME BY SALINON : Original Name Generator

First Initial Names	Save Names
BOB BOBBI BOBBI BOBBI BOBBI BOBBI BOBBI BOBBI BOBBI BOBBI	WATLAT FEN MITE MITE MITE MITE MITE MITE MITE MITE
<div> <div>← 24 →</div> <div>← 24 →</div> <div>← 24 →</div> <div>← 24 →</div> </div>	
<div> <div>← 24 →</div> <div>← 24 →</div> <div>← 24 →</div> <div>← 24 →</div> </div>	
<div> <div>← 24 →</div> <div>← 24 →</div> <div>← 24 →</div> <div>← 24 →</div> </div>	

F1 Help **F2 Save** **F3 Print** **F4 Print Save** **F5 Save Load** **F6 Save Print**
F7 Echo Off **F8 Echo On** **F9 Speed Up** **F10 Slow Down** **F11 Filter On** **F12 Filter Off**

Namer follows three paths to generating unique product and company names. One (see bottom screen) is to randomly match pronounceable morphemes. Another is to combine word parts that already make sense but imply something new together. The third method generates a phrase that describes a particular company or service.

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PC type _____

Phone (day) _____ (evening) _____

Certificate Maker: Easy Achievement Recognition

BY CHRISTOPHER
JOHNSTON

Do you think it's too much of a pain to have an employee-of-the-month plaque? Or too expensive to have an occasional appreciation dinner? If so, then *Certificate Maker* from Springboard Software is for you. You can churn out certificates with no trouble and little cost, thereby keeping employee morale and momentum sky high.

Certificate Maker has over 200 templates for diplomas, awards, and other framable certificates to choose from. You simply input the template number, specify a border (single, double, or triple line; spiral; African; Arabian; or no border) and then choose a font for the name (serif, sans serif, art deco, script, or gothic).

The program then lists op-

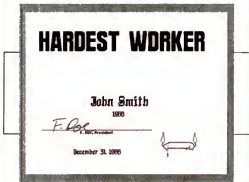
tions for printing, defining the printer (all major dot matrix printers are supported), or exiting to the main menu. After you print your document, you can affix stickable seals with

messages like "Good Job," which add a personal touch.

Springboard Software sells a lot of educational software, and its products are remarkable for their ease of use. *Certificate Maker* is no exception. The manual is necessary only for choosing one of the certificate templates pictured within.

Certificate Maker is useful

for kid things like Scouts and school awards, but there's also plenty of use for it at the office—even adults like a little ceremonial recognition. And it's cheaper than a gold watch. **AB**



Certificate Maker, \$59.95 from Springboard Software, makes it easy and inexpensive to create and print certificates to recognize any achievement or special occasion.

PC FACT FILE

Certificate Maker

Springboard Software
7807 Creekridge Circle
Minneapolis, MN 55435
(612) 944-3915.

List Price: \$59.95

Requires: 256K RAM, color graphics adapter, parallel port, dot matrix printer, DOS 2.1 or later

In Short: Certificate-making program that creates over 200 different styles that are printable on your dot matrix printer. For cheap, easy, morale-building thrills. Not copy protected.

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CIRCLE 536 ON READER SERVICE CARD

PC MAGAZINE ■ OCTOBER 28, 1986

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It is so easy to install and you never have

Disk intensive programs (like databases) can run 2 to 4 times faster.

to do anything again; it does it all for you — like lightning.

LIGHTNING comes to you on a diskette. You simply load it onto your DOS diskette if you are using floppies, or if you have a hard disk, into the DOS area. Simple A-B-C instructions let you get it started the first time in five minutes. Then it is always ready, working automatically in the background any time you boot up. (The copy protected version is a "key diskette" and doesn't boot with the DOS.)

What's it like to use it? If you have ever worked with or seen a RAM Disk you know what a difference speed can make when working with any program that frequently accesses the disk. Well, **LIGHTNING**

enables those programs to approach the same rapid speed as a RAM Disk, but it does it without the disadvantages. With a RAM Disk there is a constant danger that you can lose your precious data if you forget to copy it back to the disk drive. With **LIGHTNING** you just use your programs normally. You don't have to remember anything.

LIGHTNING has a fun feature that shows you just how fast you're operating. Any time you want, with a couple of keystrokes you can see a screen that keeps a record of how many times you've accessed the disk, and how much time **LIGHTNING** has saved you. It's fun to check it out, and it's always astounding. Speed-up varies, depending on your application, frequency of disk access, and amount of RAM you can allocate. For example, best results occur with indexed databases.

When you work with a database program or most word processors, or any time you need to frequently load files into RAM or save them back, you are accessing your disk. It is such a pleasure to cut those times often in half and up to one-fourth.

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and saving. Recalculation speed is not affected.

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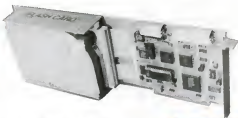
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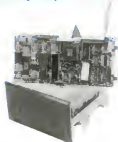


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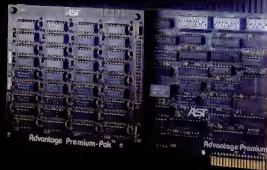
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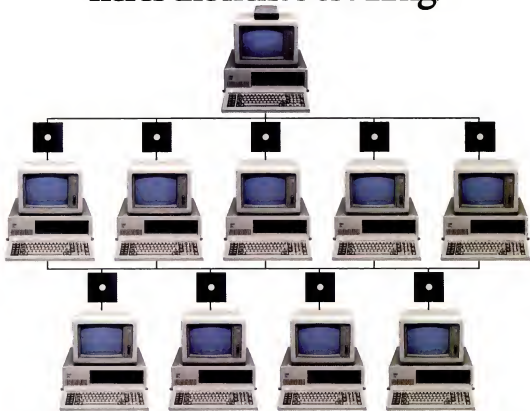
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CIRCLE 145 ON READER SERVICE CARD

■ FROM THE EDITOR'S SCREEN ■ BILL MACHRONE

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If you "read the chips," you'll find out how software and hardware manufacturers are cooperating toward a mutually beneficial (and PC-revitalizing) future.

It used to be easy. You'd just pick up the electronics trade journals. With a little insight, you could dope out what the next generation of machines would be like. I call it "reading the chips."

The chip business isn't about the number you ship, not really. It's about design wins. That's the measure of how many new products are committed to using your new chip design. There is strength in numbers, so design wins beget additional design wins. Of course, a number of them are specious. Designers can change their minds, and some products never get built at all. For Intel, Motorola, and National, a heated battle rages among the 80386, 68020, and 32032 for dominance in the next generation of workstations, file servers, and minicomputers. There's no contest for personal computers; Intel has it all sewn up with the 386.

If you track Apple, now is your chance to object and say, "But wait! What about the next generation of Macintoshes?"

Fair question. Part of the art of chip reading is factoring each company's unique personality and prejudices. Apple, for example, sports a long-standing antipathy to Intel processors and has a huge inventory of 68000 experience. So it goes without saying that the new Macs will be 68020-based. But will they be personal computers? I think not. I believe Apple has its sights set on the workstation market now dominated by Sun and Apollo. Bearing in mind that workstations and PCs are on a convergent course, I'll one day have to sit down and redefine the new Macs. But not yet.

PERIPHERAL POWER Chip reading has historically been easiest with peripheral support chips. When Western Digital built the 1771 floppy disk controller, it was a shoo-in for the very next round of personal computers. It replaced half a board's worth of discrete components and integrated circuits. Ditto when the 1791 replaced the 1771 with more integration and more power. The more integration the better: board "real estate" is expensive. Each chip costs money, as does every connection on the board. Each connection tends to reduce reliability and affect quality control, too.

The nice thing about disk controllers is that the manufacturer is generally free to change chips without impinging on the user's perception of the machine's performance. Better still, with the exception of a few benighted copy-protection vendors, changing the disk controller doesn't affect the software vendor, either.



Other chips, once designed in, tend to be "sticky," because they affect the way software or the user interacts with the machine. I, for one, was disappointed all the way back in 1982 when IBM selected the 6845 graphics controller for the PC. The 6845 was already old hat. However, in a miracle of geriatric medicine, IBM artificially extended its life, much as if someone had added 200 years to your lifespan. That doesn't sound bad, but people continue to learn new things. Chips don't.

Back in 1983 no semiconductor house would have considered doing a superset of the 6845, no matter how much better it could have made PCs. The market wasn't stable enough. There was no support from the monitor manufacturers. There was no software support. And users would have been too chicken to buy it, no matter how good the resulting product.

With so much riding on the graphics controller, you might well expect a lack of courage or innovation. But what about something really mundane, like the serial port? The 8250 is one of the buggiest chips ever to make it into wide distribution. Fortunately, most of its modes don't affect normal PC operation. But communications software designers have had to wrestle endlessly with the chip's idiosyncrasies. Did they yell and scream? Did they demand fixes or better chips? No. They rolled over and played dead.

How does that affect the end user? If software designers had insisted on more-capable chips, they could have produced communications software with more functionality and power. But it takes coop-

■ FROM THE EDITOR'S SCREEN

eration and commitment on both the hardware and software sides to make a new chip fly.

That's happening today with the new graphics chips. The Intel 82786 and Texas

Instruments' 34010 are powerful yet dramatically different chips. But the software people made a commitment early in the game, so that TI and Intel, together with the board manufacturers that are integrat-

ing their chips onto PC-compatible cards, can go forth with confidence. They know that they will have the critical software drivers for AutoCAD, Microsoft Windows, future Lotus products, and more.

Synergy doesn't come cheap. The chip manufacturers had to put their cards on the table pretty early in the game, and the software houses had to commit themselves to long lead times and untested standards. Both had to take the future vitality of the PC market on faith, and faith never comes cheap.

THE FUD FACTOR Then a funny thing happened. Instead of being subject to the future vitality of the PC market, they ensured the future vitality of the PC market. The reenergization of the market that we see in the latter half of 1986, which will carry over through 1987, is directly attributable to the major long-term commitments made by hardware and software vendors.

Historically, end users have been beset by the FUD factor, or Fear, Uncertainty, and Doubt. Time was when every purchasing decision could be seen as a potentially bad choice. Now there are virtually no wrong choices, just a question of suitability of purpose. Today, the spirit of cooperation among software and hardware vendors has created an atmosphere of harmony and future compatibility. Thus unfettered, corporations are free to pursue their PC objectives without the nagging feeling that they are going to be left in the lurch.

Meanwhile, the best and brightest of the computer manufacturers are riding the crest of the wave of new chips, from the 80386 to new RAM designs to more highly integrated motherboard support chips. Many manufacturers are designing their own custom gate arrays. Instead of cranking out slavish, cookie-cutter copies of the IBM XT or AT, the new generation of manufacturers has become endlessly creative, but always within the strict confines of MS-DOS compatibility.

So reading the chips isn't what it used to be. With the advent of custom integrated circuits and more design choices, it isn't always obvious what chips the next PC will contain. But, inexorably, they become faster, smaller, and cheaper. □

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■ JOHN C. DVORAK

LET'S MODERNIZE THE MICROCOMPUTER



For now, the PC is still a buggy without a horse. Let's hope that the next generation of computers will abandon some of the arcane models of the past.

Over the past 10 years the microcomputer has come a long way, but not far enough for my taste. In the good old days (a mere decade ago), the machines were impossible to deal with. Looking back on those days, I can't imagine why we put up with the things.

Weird data cartridges that never worked right, high-speed random access cassette decks (phi-decks), and even punched paper tape were all used by one machine or another in those days. Most people used the cheapest J.C. Penney cassette players to record and retrieve programs. The first ones raced along at 300 baud. The more-technologically-risky tape formats could transfer data at an alarming 1,200 baud. Golly! It was sure faster than keying in data by hand, I suppose. Within a year or two, some floppy disks showed up. I used a Northstar system in those days. It held 70K bytes of data. Needless to say, everything was completely incompatible with everything else.

The incompatibility was so bad that each computer arrived with no I/O routines. You couldn't communicate with either the mass storage device, the serial or parallel ports, the video screen, or sometimes even the keyboard without writing a custom assembly language program. This foolishness continued until IBM came along and standardized the ports. The importance of the standardization of I/O should not be taken lightly.

Whether IBM did this to make life easier for us all is moot. We do know that IBM did not get carried away with change. Its machines were not a radical departure

from what came before and it adopted many of the traits of previous microcomputers. IBM picked the 5¼-inch disk for mass storage and reinvigorated the concept of memory-mapped video, which had been on the decline, with the advent of inexpensive addressable terminals pioneered by companies like TeleVideo. While these carryovers were great, we also got the dirty bathwater with the baby.

EASY GOOD-BYES Let's get rid of some things. The first agenda item is the use of the DB-25 connector for serial port communication. We can all thank Apple for promoting the DB-9, a more practical device since the connection requires only 6 pins. What's the point of an expensive 25-pin connector and prohibitively expensive 25-wire cable when only 6 pins are used? This has mystified me for years. The AT at least uses a DB-9. Perhaps an altogether-new connector would be a good idea.



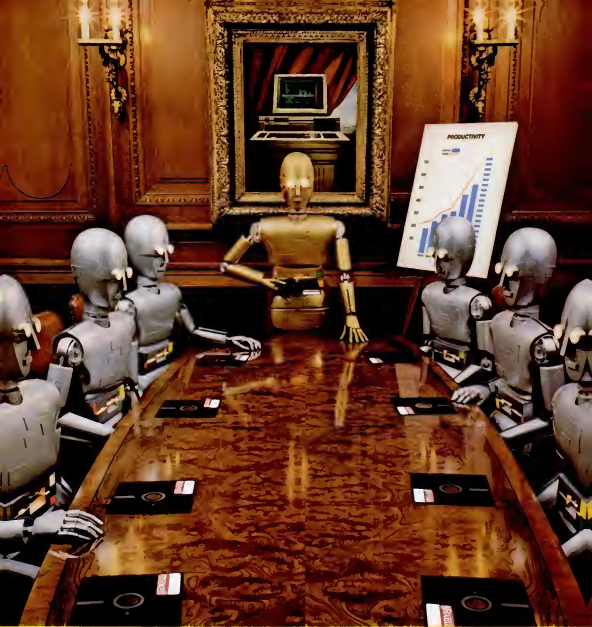
In fact, let's get rid (once and for all) of the serial printer and make every printer a Centronics Interface parallel device. Why not? Leave the serial port to the domain of the modem, or get rid of it altogether and make the modem a parallel device. The only rationale for keeping the serial port is for the development of a cheap 6-pin connector, which would save a ton of money on the interconnects.

And let's get rid of the little screws that screw the connector tight to the connection. Who wants to screw in each crummy connection to keep it secure? Isn't there such a thing as a modern clip-on connection? A bayonet mount? Anything! Hey, folks, this is 1986 . . . there are plastics and fantastic technologies that eliminate the need for a clumsy Phillips-head screw on a simple connector.

Let's also get rid of the hokey edge card connections. They simply won't cut the mustard when we begin to see clock speeds in excess of 25 MHz. These chestnuts are throwbacks to the S-100 bus and the Apple bus.

Finally, let's dump the TTY user interface. I'm sick of typing DIR and watching stuff scroll off the screen like a roll of toilet paper zipping through a teletype. We need to rethink our models.

At one point in their history, cars stopped looking like buggies without the horse; they became distinctive—cars. Let's hope that the next generation of computers will not only be inexpensive and powerful but will abandon some of the arcane models of the past. For now, the PC is still a buggy without a horse.



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■ JOHN C. DVORAK

INSIDE TRACK

The Austin clone-killer meets the Austin superclone—details and film at 11!

If you think the IBM PC clone business is a mess, then, as P.T. Barnum once said, "You ain't seen nothin' yet." The PC AT clone scene is going to bust loose in the next few months and continue through next year, undoubtedly drawing some interest away from the speed-burning 80386 upstarts.

The company that is most affected by this, of course, is IBM. A couple of research companies have theorized that IBM Austin is preparing to introduce a new PC that will replace the old XT and knock out a few clone makers—a clone killer. Here are the rumors. You try to figure it out, then I'll tell you what's really happening.

Rumor A: IBM never intended to do much with its PC Convertible. The Austin automated factory was designed to make a low-cost PC. The Convertible was made in Austin to get the bugs out of the new plant. Months ago the plant was shut down for a switch over to the new PC. This accounts for any shortages of the Convertible.

Rumor B: Add this to rumor A. To confirm the total discontinuance of the old PC, look for Sears and other retailers to dump PC-XTs on the market for \$999 or less.

Rumor C: A lot of internal bickering went on at IBM concerning the use of 5½-inch drives in the new Austin clone-killer. "If we're going to do a clone killer, then we have to have 5½-inch drives!" screamed one guy. "No, no, no. We have to make the jump to 3½-inch, and we may as well start with this new machine. We can't keep going back and forth," said another. The new machine will have 3½-inch drives.

Rumor D: The most curious rumor comes from in and around Austin. Ac-

cording to columnist Jim Scymour (he lives in town), there is a silly rumor going around that the clone killer will incorporate an 8086! As a nerd would say, "It is to laugh." Forget it.

THE REAL STORY Here's the new machine according to Dvorak: 8088, 4.77 MHz, 3½-inch disks, surface mount and VLSI, same innards as the Convertible, built-in serial and parallel ports, three slots, similar in look to the Convertible. The motherboard will support 512K. The machine will be sold in a 256K, two-drive version for \$1,295. A stripped-down one-drive, 128K model will go for \$995. At this writing, it's slated to be dubbed the IBM PC-ET (enhanced technology). Initially the thing was to be announced by the time you read these words, but IBM may hold off.

IBM wants to show up Apple and announce the PC-ET on the tails of the Apple "Courtland" (the 16-bit Apple II). In this way they can see the reaction to the Apple announcement, confirm pricing, and make any necessary adjustments to strategy. **Pretty defensive**, if you ask me. Apple puts on an unforgettable show for its product rollouts; IBM will look pale by comparison. And this all comes after an attention-getting surprise 80386 Compaq announcement! IBM should have announced theirs last month. Otherwise it's ho-hum time.

Superclone Dept.: To make things worse for Big Blue, apparently PC's Limited is planning to roll out a passel of hot machines. No sooner did I compliment Michael Dell for his design on the 12-MHz PC AT clone than he showed the staff of PC Magazine a nifty 16-MHz superclone PC AT that will sell loaded for about \$2,995. He's now working on

an even swifter 24-MHz model!

To top it off, Dell tells me that he's going to pull an Osborne—bring out a people's AT. He's going to release a VLSI-based superclone of the PC AT (probably a 12-MHz model) loaded with built-in ports, EGA, megabytes, disk controllers, you name it, and sell it for around \$1,000. This thing will blow away the new IBM machines.

Dell pioneered the superclone. A superclone, just in case you're not aware, is more than a clone. In the past, cloning was done to simply copy the functionality. IBM was so slow to move up the performance (in fear that it would impinge on its own System 36/38 mini-computers) that, like an old biplane with a Ford engine, it stalled, leaving the performance improvement up to the clone makers. When we run benchmark tests on Dell's hopped-up superclones we get incredible performance values, typically around ten times the normal. And, they're reliable! As they say on the late-night horror flick, "Pretty scary, kids!"

Woe-Is-Me Dept.: So IBM is oblivious to the superclones for now. It sees Tandy as more of a threat. After the run of the new Austin clone-killer at the automated plant, IBM plans to gear up with a stripped-down PC AT that will incorporate 3½-inch drives (700K). It's aimed right at the newest Tandy 3000 offerings. With IBM trying to get a patent on its bulky PC AT case, I don't know how it's going to switch to the more elegant, smaller footprint, though. Any patent attorneys out there want to check out IBM filings? Send me a memo.

Anyway, the kicker to the mini AT is that IBM wants to make it so you can't put a hard disk in it! It's the old product-differentiation game that went out with the electric knife and the three-tone paint job. Of course, we all know that a guy in a garage will come up with an instant fix for it. So who cares?



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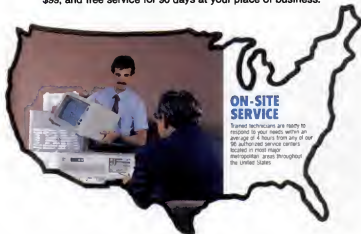
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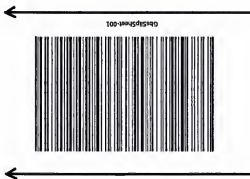
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THE FUTURE IS SITTING IN OUR LAPS



The upcoming generation of 386-based PCs will bring some important new developments with it. Also, Norton rates the latest batch of laptop portables.

As I mentioned in my last column, the next generation of 386-based PCs is definitely on the way. Just how soon these machines will arrive should be clear from two little news items that appeared back in the slow summer days of July. One item was about American Computer and Peripherals, in Santa Ana, California, making the first public announcement of a 386 PC—in the form of an add-in board for the AT called the Turbo-386. ACP's 386 board should be available about the time this issue of *PC Magazine* reaches you.

The other item was from the Rumor Central column in our sister publication, *PC Week*. According to Rumor Central's feline reporter, Spencer F. Katt, Compaq has had its 386-based PC out in the field for secret testing since midsummer.

There's no doubt that the 386 machines are hot, really hot. According to second-hand reports, the computing-speed index in my SysInfo program clocks the speed of the Compaq at around 20 times the speed of a standard PC. ACP claims about the same speed (about three to four times the speed of an AT) for their add-in board.

That's blazing fast.

There are two ways to look at that new speed potential, just as there were two ways to look at the extra speed the AT gave us. One is to say "so what?" After all, most of us are getting along just fine with regular PCs, and while speed is nice, it's mostly a luxury—and an expensive one at that. After all, how much time do you really spend waiting for your PC to get its computing done?

FASTER IS BETTER The other way to look at it, though, is to say "the faster the better." For some people, speed is essential—after all, if your 1-2-3 spreadsheet recalculations take 5 minutes (or worse, 10 or 20), you can't afford the time to do much what-if-ing, which is a big part of what spreadsheets are all about.

Speed is always valuable. If you have to wait even a half-second for your word processor to scroll to a new screen page, your train of thought can become derailed. For full-time, serious, professional users, "unnecessary" speed can make an important contribution to productivity and satisfaction. That's why I give my staff, and even the free-lancers working for me, ATs and Compaq 286s.

The 386 machines will bring two important developments with them. One will be like when the AT-class 286 machines appeared: we'll just have some really fast PCs to work with. The other is what we

should have gotten with the 286 but didn't: bold new operating system environments, such as the rumored ADOS, Windows-386, and DOS 5.

These new operating system environments will lead us into the future of PC computing, where things are going to be very different—much more powerful, much more user friendly, and much more sophisticated.

For most of us, however, all these changes won't matter much, at least not for a while. Most of us are married to stock PC applications, whether we're using them on a standard-speed PC, an AT that runs 5 times faster than a PC, or a 386-based machine that runs 20 times faster.

TIES TO THE PRESENT While PC computing is going to move forward in ways we can't yet even imagine, the practical world has a huge investment in stock PC computing, and it ain't going to budge until it's gotten its money's worth. How big that investment is may shock you: over \$20 billion in PC hardware and probably over \$50 billion in software and training.

That's my view of the coming 386 revolution in PC computing. What about the here-and-now revolution that we're seeing in portable PC computing?

LAPTOP EXPLOSION As you've seen here in the pages of *PC Magazine*, there has been quite an explosion of portable PCs, particularly of the laptop variety (as opposed to the luggable variety). Here's my perspective on the new batch.

Most of these new machines are pretty



■ PETER NORTON

good, and it's likely that you'd be happy using any of them. A year or two ago, I don't think I could have said that, but the machines have been improved enough so that you don't need to be steered away

from them altogether; you just need to be steered toward the picks of the litter.

Nailing down what's good and what's bad in portable PCs is a subjective matter that's going to depend on the features and

characteristics that matter most to you. For example, the machine that I think is one of the worst—the Zenith 171, aka the Morrow Pivot, which the IRS chose for its portable—might suit you to a T. But on the whole, we can categorize these machines as good, better, and best.

Not among the best, I'm afraid, is IBM's PC Convertible. We all waited many rumor-filled months for this machine, but it turned out to be a disappointment. The Convertible clearly is cut from similar cloth as the deceased and unlamented IBM Portable. There are a few nice engineering touches (for example, the nifty way the Portable's keyboard is attached to the case, a great solution to a problem Compaq continues to flub; and the nifty way the Convertible's keyboard tilts up when the case is opened), but the Convertible is marred by painful flaws. It is too big and too heavy, supports only 512K bytes of RAM, contains a modem that's not Hayes compatible, and is plagued by terrible distribution—I'm still waiting for half the parts I ordered.

TOSHIBA'S COUPS In contrast, Toshiba's T1100 is superior to IBM's Convertible, and the improved T1100 Plus is clearly superior, with advantages like more computing speed (it rates about a 1.7 compared with the standard PC in my SysInfo speed index) and the ability to use a standard 5¼-inch disk drive as an external option (the IBM Convertible can't, which severely limits its ability to work with other people's data or with copy-protected programs).

If all Toshiba had done was to create the T1100 Plus, we'd just be giving it some quiet applause. But the thunderous clapping and shouts of "Bravo!" go to Toshiba's other creation: the T3100, a lap-sized computer with the speed of an AT and a 10-megabyte internal hard disk.

NO MACHINE IS AN ISLAND It's pretty clear that no one machine is going to satisfy everybody's need for a lap-sized PC. That's one of the main reasons why it has taken so many false starts and so long to get the right machines to the market. A key part of the problem was that the "ideal" features couldn't be packed into one machine, since "ideal" meant too many

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things to too many people. Toshiba had the genius to realize that it took two machines to cover the full range of needs. The T1100 Plus covers the end of the spectrum that values battery operation and weight foremost, while the T3100 covers the end that values AT speed, hard disk storage, and an easy-to-read screen.

The two Toshiba machines do such a good job of covering the laptop computer spectrum that I think most people shouldn't consider any other brand. Just choose which of these two machines best suits your needs.

While the two Toshibas are the cream of the crop for laptop size, there is one other portable machine that I admire and highly recommend: the Compaq Portable II.

There are some real disadvantages to laptop machines. Key among these are no internal expansion slots, compromised keyboards, and severe display limitations that can really crimp things for some software (including *SideKick* and my *Norton Commander*).

■ It's pretty clear that no one machine is going to satisfy everybody's need for a lap-sized PC.

The solution to these problems is the Compaq Portable II. The price of the solution is, of course, a luggable portable rather than a light, lap-sized portable. But at least the Portable II is noticeably easier to carry around than the older Compaqs.

PORTABLE POWER Taken together, these three machines do a very good job of covering the spectrum of needs for portable PC computing. The Portable II maximizes features at the cost of laptop benefits. The T1100 Plus gives you the best battery-powered laptop and the T3100 the most powerful power-cord laptop. For just about everybody, one of these three machines should provide the "ideal" (read "best practical compromise") portable computer.

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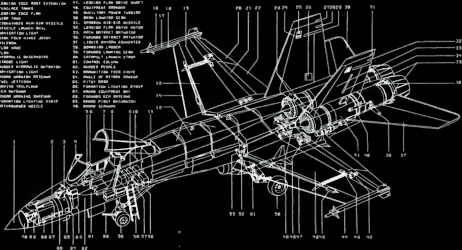
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GREAT POP-UPS: THE PUBLIC SOUNDS OFF



Give PC Magazine readers half a chance and they'll tell you exactly what they would like to see available in new software products. Program developers, take note.

A couple of months ago, I wrote here about the shortcomings of most "pop-up" desk-accessory programs for PCs ("Looking for the Ultimate Pop-up," *PC Magazine*, Volume 5 Number 9). Most of these programs don't do what I usually need done, and I proposed some new kinds of pop-ups I thought a lot of us would find handy.

I also asked for your suggestions on what you'd like to see that's presently not available in pop-up software.

We're still digging out from under the letters. *PC Magazine* readers are a remarkably opinionated and outspoken group, and reading through the ideas has been a delight. I want to add a few notes to my original thoughts, then pass along a few of the better ideas for new pop-ups from the mailbox.

SMART NOTES One of my cries was for a product that would allow me to stick little 3M Post-It-like notes into documents, database records, and other files. Something like an all-purpose *Note-It*, which already annotates spreadsheets.

Magazine deadlines are nasty beasts, and I got bitten by one: the first ads for *Smart Notes*, just that much-hoped-for Post-It-like program, appeared in the very same issue of *PC Magazine* as that column. A lot of kind readers wrote to tell me about those ads.

The report: *Smart Notes* has already become indispensable around here. I wish it were different in some ways—for example, I long to be able to append more and longer notes than its 5-or-10-line, 50-

notes-per-file limit. But touches of brilliance, such as being able to color-code several different users' notes on a file, abound. Even in its first release, *Smart Notes* is a natural, one of those surprising tools that's even more useful than I'd expected.

CALCULATOR POP-UP I also pleaded for a pop-up calculator that emulated the Hewlett-Packard 12C, a standard tool for financial analysis. Still more readers wrote to tell me I'd overlooked one already available from a vendor whose ads run in the back pages of this very magazine. I'm appropriately chastened; I read the little ads more closely now.

Even better, I now have three different new HP 12C pop-up programs on my desk, in various late stages of beta-ism. That's all I can say for now, but all you fellow 12C freaks can rest easy: you'll love what's coming. Soon.



READERS RESPOND Readers' suggestions for new kinds of pop-up utilities ran the gamut from the intense and bizarre (seven pages of 16-character-per-second dot matrix type on the need for pop-up Fast Fourier Transforms) to the short, funny, and lucid.

My four favorites:

Mark Peele in Chicago had a bunch of fine ideas, the best of which was *Browser*, a pop-up that lets users label, then compare on-screen in separate windows, diverse parts of one or more files. You'd scroll through the files you wanted to compare, mark off blocks, and give them short name tags.

Browser would organize those blocks into a list, then, at the touch of a key pop-up, let you select items from that list, and show them in windows of whatever size you wished.

Richard Nolan in Arlington, Virginia, wants a pop-up that can kill a file being dispensed to a printer from a software spooler. As he pointed out, utilities such as AST's SuperSpool usually have commands to abort the print job—but, since you're usually in the middle of an applications program, you have to drop out to DOS, issue the command, then reenter the application (unless that program offers a "Window to DOS" option, which still may not work with spool-abort commands).

A short .BAT file can take some of the typing out of spooler-killing and reentry into the application, but it won't shorten the round-trip much.

Nolan's idea for a SPOOLKIL pop-up

Illustration: Cary Henne

■ JIM SEYMOUR

is a fine one with a large potential market. Even better, why not fold it into a complete pop-up spooler, which would let you change the parameters of the spooler itself, allow you to set the number of copies to

print, and so on—all popped up?

Marc Stevens in Montclair, California, wants a tiny spreadsheet to pop up through other programs when a small matrix—say, 10 by 10 to 20 by 20 cells—is plenty.

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Make it easy to cut and paste from a few cells to the whole grid of calculated values (and column and row headings) into the document you're working on, and *Tiny-Spread* becomes a sensational tool.

Finally, Steve Friedman in Sacramento suggested a pop-up line-draw utility. Usable with any program, it would at the touch of a few keys let you draw boxes around passages you wanted to emphasize in the printout.

Four nifty, worthwhile ideas.

I should add two more themes from readers' letters. First, many want their own "pop-up toolkits"—many small, single-function pop-up modules they can knit together into their own personalized subset of pop-ups. Popular Programs' *Pop-Up DeskSet PLUS* is a start, but a kit of 20

■ Readers' suggestions
for new kinds of pop-up
utilities they'd like to see
available ran the gamut
from the intense and
bizarre to the short, funny,
and lucid.

pop-ups would be a lot better than *Desk-Set's* 5 or 6.

And second, a fair number of PC-and-Macintosh two-computer owners wrote to point out that many of these functional little utilities are already available for the Mac, often as shareware—and often in far more elegant implementations. They're right; score one for Cupertino.

As appealing as these ideas for new PC pop-ups sound, many would be fiendishly difficult to code: tough to implement as standalones, extremely hard to make compatible with the wide range of applications they'd have to pop-up through.

On the other hand, developers and programmers, *The People Have Spoken*: there's money in all these ideas. Any takers out there?



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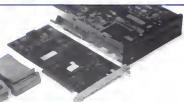
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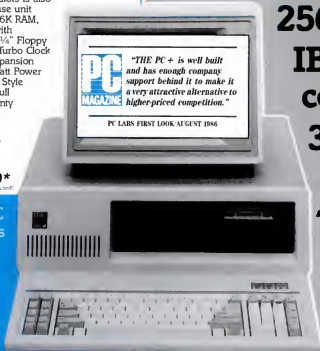
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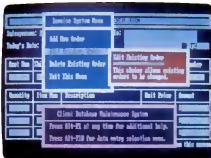
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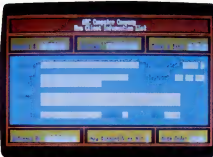
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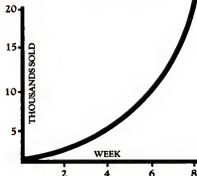
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■ STEPHEN MANES

THE DUMPTY DICTIONARY, VERSION 2.0



Deciphering the lingo often stands between users and a true understanding of the PC industry. Here's a heretofore-secret translation table for the latest techno-talk.

A year and a half ago (PC News, page 55, *PC Magazine*, Volume 4 Number 7), we managed to salvage noted consultant H. Dumpty's pioneering definitions of many common computer terms despite the abrupt and fatal termination of our interview. Now more of his work has been discovered beneath a mound of unsent registration cards. We proudly present it here.

Beginner A person who believes more than one-sixteenth of a computer salesperson's spiel.

Advanced user A person who has managed to remove a computer from its packing materials.

Power user A person who has mastered the brightness and contrast controls on any computer's monitor.

Sales associate A former cheesemonger who has recently traded mascarpone for MS-DOS.

Sales manager Last week's new sales associate.

Consultant A former sales manager who has mastered at least one-tenth of the *dBASE III Plus* manual.

Systems integrator A former consultant who understands the term AUTOEXEC.BAT.

Warranty Disclaimer.

Service Cursory examination, followed by utterance of the phrase "It can't be ours" and either of the words "hardware" or "software."

Support The mailing of advertising literature to customers who have returned a registration card.

Alpha test version Too buggy to be re-

leased to the paying public.

Beta test version Still too buggy to be released.

Release version Alternate pronunciation of "beta test version."

Enhanced Less awful in some ways than the previous model, and less likely to work as expected; e.g., "Enhanced Graphics Adapter," "Enhanced Keyboard," "Enhanced Extended Memory Specification."

Convertible Transformable from a second-rate computer into a first-rate doorstop or paperweight. (Lexicological note: replaces the term "junior.")

Upgraded Didn't work the first time.

Upgraded and improved Didn't work the second time.

Fast (6 MHz) Nowhere near fast enough.

Superfast (8 MHz) Not fast enough.

Blindingly fast (10 MHz) Almost fast enough.



Astoundingly fast (12 MHz) Fast enough to work only intermittently.

Memory-resident Ready at the press of a key to disable any currently running program.

Multitasking A clever method of simultaneously slowing down the multitude of computer programs that insist on running too fast.

Encryption A powerful algorithmic encoding technique employed in the creation of computer manuals.

Desktop publishing A system of software and hardware enabling users to create documents with a cornucopia of typefaces and graphics and the intellectual content of a Formica slab; often used in conjunction with encryption.

High resolution Having nothing to do with graphics on IBM-compatible microcomputers.

FCC-certified Guaranteed not to interfere with radio or television reception until you add the cable required to make it work.

American Italian or Taiwanese, as in "American Telephone and Telegraph."

American-made Assembled in the United States from parts made abroad.

Windows A slow-moving relation of the rodent family rarely seen near computers but commonly found in specially marked packages of display cards, turbo cards, and Grape-Nuts cereal.

TopView The official position of IBM brass that an abysmally slow character-based multitasking program is the product of the future.

Shareware Software usually distin-

■ STEPHEN MANES

guished by its awkward user interfaces, skimpy manuals, lack of official user support, and particularly its free distribution and upgrading via simple disk copying; e.g., PC-DOS.

DOS shell An educational tool forcing computer users to learn new methods of doing what they already can.

UNIX Sterile experts who attempt to palm off bloated, utterly arcane, and con-

fusing operating systems on rational human beings.

EMS Emergency Medical Service; often summoned in cases of apoplexy induced by attempts to understand extended, expanded, and enhanced expanded memory specifications.

Videotex A moribund electronic service offering people the privilege of paying to read the weather on their TV screens instead of having Willard Scott read it to them for free while they brush their teeth.

Artificial intelligence The amazing, humanlike ability of a computer program to understand that the letter y means "yes" and the letter n means "no."

Electronic mail A communications system with built-in delays and errors designed to emulate those of the United States Postal Service.

C-py pr-t-ct-n An obscenity unfit to print and fast disappearing from common parlance.

Turbo card A device that increases an older-model computer's speed almost enough to compensate for the time wasted in getting it to work.

Laser printer A xerographic copying machine with additional malfunctioning parts.

Workstation A computer or terminal slavishly linked to a mainframe that does not offer game programs.

RISC The gamble that a computer directly compatible with nothing else on the planet may actually have decent software written for it someday.

AUTOEXEC.BAT A sturdy aluminum or wood shaft used to coax AT hard disks into performing properly.

Plotter A terrorist hypodermic device used to inject boring graphic representations of boring data into boring meetings.

Clone One of the many advanced-technology computers IBM is beginning to wish it had built.

CD-ROM An optical device with storage sufficient to hold the billions of predictions claiming it will revolutionize the information industry.

IBM Product Centers Historical landmarks forever memorializing the concept of "list price only."

IBM Somewhat like an IBM product, in current parlance, invariably followed by the word "compatible."

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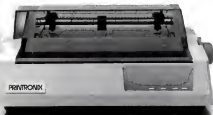
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■ STEWART ALSOP

AN OPEN LETTER TO IBM



With the compatible makers encroaching rapidly on IBM's share of the PC market, Alsop figures IBM could use a little advice on how to keep up with (and again dominate) the pack.

Just about 5 years ago, IBM shipped its first PC to a customer. A lot of water has gone under the bridge since then: Some 5 million or more PCs or PC-compatibles have been sold. Sales of PC-DOS computers now account for about 60 percent of all personal computers sold. Manufacturers are designing PC-compatible machines around the third generation of processors. Operating speeds have increased from 4.77 MHz to 16 MHz or more. Average installed memory has increased from 16K bytes to 512K bytes. Common display standards can now handle 16 colors at a resolution of 350 lines by 640 pixels. There are three recognized network standards. And well over 20,000 applications programs have been written for PC-DOS, which itself is in its third major version.

While all of these advances were happening, IBM's share of the sales of PC-DOS computers has gone from 100 percent in January 1982 to about 45 percent in January 1985 to what looks like about 40 percent in January 1987. Whether that is a development that worries IBM or not is a matter of some debate, since PCs represent a "mere" 12 percent or so of the company's revenue. Indeed, IBM is probably somewhat more concerned about the problems it is having with mainframe computers, which account for about 60 percent of its revenue.

BUILD A BETTER PC But what is clearly a matter of constant and furious debate is what IBM should do about its declining position in the PC-DOS computer

market. I don't know about you, but it seems obvious to me what IBM should do: it should make better computers.

The computer business isn't that hard to understand. All you need to do is make something that solves people's problems in a way that is either superior to or less costly than something that other vendors make. (You also have to have enough money, know how to get your message across to your customer, and manage your company well, but let's not get side-tracked.) In the past 3 years, IBM has committed the cardinal sin of letting other companies get so far ahead of it in either cost or performance that customers started shopping elsewhere in large numbers.

Not being shy about expressing my opinion, I thought it might help IBM if I told it how to solve its problems with PCs.

1. Stop worrying about minicomputers and mainframes. No, I don't mean ignore the products that produce most of your rev-

enue and profits. But don't design your PCs around your big computers. Personal computers are designed for individuals to use. The more you design personal computers to work well with big computers, the less attractive PCs will become to those who use them. Even in a world dominated by data processing departments, end users still have a lot to say about which personal computers are bought.

2. Stop worrying about the software and peripherals companies so much. Every time you change the ROM BIOS in the PC, everybody in the software and peripherals business gets on his high horse and accuses you of being incompatible. But every time you introduce a new computer without designing in more value, you hand over another 10 percent of your market share to the compatible makers. The point is that you own that ROM, so use it to make better computers. When you changed the ROM in the Convertible, for instance, you did it for no apparent reason. That's pretty stupid. What if, instead, you had designed in a standard way to reserve parts of memory for memory-resident utilities? Nobody would have complained about the ROM change, since you would have given people some real benefit.

3. Stop making wimpy design decisions. Everybody in this industry goes around chortling about your habit of making a product only as good as it needs to be. As Adam Osborne says, "Adequacy is all IBM needs." That's not true anymore. Instead, make use of some of that massive R&D you've got going to give users things they need. Right now, Apple has got you



■ STEWART ALSOP

beat on the operating environment, the display of fonts, and data integration. Tandy's got you beat on price, memory, and speed. Compaq's got you beat on portability and backup. Why don't you step

out with your next machine and, say, design in *Microsoft Windows* and either Intel's 82786 or TI's 34010 graphics coprocessor? If you do that, though, don't forget to price it right. No more \$24,000

workstations like the RT PC, please.

4. Stop selling PCs yourself. I know you've got, what, 30,000 people selling your stuff to your big accounts. But they wouldn't know a good PC if it fell on their heads. So let them sell what they're good at selling—mainframes, minicomputers, wide area networks, and 800-megabyte drives—and give the PCs back to people who depend on them: independent dealers.

5. Stop burying the PC in bureaucracy. All the mistakes you've made in the PC market started happening in 1984, after you started bringing the Entry Systems Division back into the corporate fold. The PC Portable and the PCjr were introduced in

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■ It seems obvious to me what IBM should do: it should make better computers.

early 1984; the PC AT with its troubled hard disk, flawed processor, and lack of an operating system in late 1984; and the Convertible in early 1986.

In fact, the last time you introduced a solid machine was the PC-XT in 1983. The PC and the PC-XT both succeeded because they were designed for the PC market, not the corporate workstation market; because they were sold by enthusiastic, independent dealers, not by sober sales reps looking to move buyers up into more-expensive systems; because they were designed to let software developers make really exciting software, not to trip up those independent buggers who write programs. So forget about tradition and make Entry Systems an independent business unit again so it can go about the business of designing and selling computers people want instead of having to worry about whose toes it might step on.

LEAD THEM, IBM As I said, the computer business isn't that hard to understand. So let's see IBM step up front and show the rest of the industry what competition is all about.

"Dear Jim, For once I'm fast, not furious."

This is the first day I can remember getting even a memo produced without a problem. It's also my first day using this new PFS:Professional Write program. That's no coincidence. For once my documents looked really professional, and they took less time and hassle. This program has everything, even mail merge pulling in data from our company files, and a built-in address book to keep track of people like you. I know we've had our furious moments getting documents out on time, Jim. That's why I thought you should know about Professional Write.

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ASYNCHRONOUS COMMUNICATIONS SHOPPING FOR SOFTWARE

COVER STORY ■ M. DAVID STONE

The wide range of communications packages on your software dealer's bulging shelves can make choosing one product a daunting task. To help you make that choice, PC Magazine tested 34 programs that can link you with the outside world.

Although the communications software shelves are among the most crowded in the PC marketplace, if you poll a random sampling of your colleagues and friends to find out which communications packages they use, you're likely to hear only a few names. A small number of programs—*Crosstalk XVI*, *PC-Talk III*, *Smartcom II*, and a few others—have grabbed the lion's share of the market.

These top programs are all useful ones that have earned their popularity by satisfying most basic communications needs. But many of the other communications programs competing for your dollars merit consideration as well. Some offer unusual features you'll find indispensable once you discover them. Others shine at a particular task that may be an important part of your everyday routine. Still others are actually more useful at general-purpose communications than the most popular programs but are simply not as well known.

To help you sort through the pile, we put 34 programs through a series of communications tasks and gave each communications program a chance to perform. In the reviews that follow, you'll find a description of each program, from its most elegant features to its worst bugs.

Of the four or five most commonly used computer applications, communications may be the most confusing. Much of the confusion comes from lumping several distinct functions under the label "communications." Few programs offer a complete range of functions, and even the ones that do tend to emphasize certain capabilities.

Software publishers often add to the confusion by giving different names to the same features—or worse, the same name to different features. For instance, in some programs "unattended operation" means



Photograph: Roberto Brenes

■ COMMUNICATIONS

the same thing that "remote operation" does in others. Yet for some software, unattended mode and remote mode are two distinct features that do very different things.

Because of the confusion, it's helpful to start with some definitions. The most basic communication function is dumb terminal emulation, common to all programs for communication between different products except for certain specialty programs. Dumb terminal emulation lets you type at the keyboard and read incoming information from the screen.

All general-purpose communications programs offer emulation of a generic dumb terminal. When documentation specifically claims it includes terminal emulation, it means the program emulates one or more specific asynchronous terminals, such as the VT100 or IBM 3101 (see sidebar "Asynchronous Terminal Emulation"). This sort of terminal emulation lets your PC act like a specific terminal when talking to a host that needs full-screen control for graphics, word processing, or other applications.

ECHOPLEX AND DUPLEX Two distinct features often confused in many programs are echoplex and duplex. Duplex is two-way communication—as opposed to television, for example, which is simplex, or strictly one-way. Duplex conversations can be divided into half-duplex and full-duplex. A half-duplex conversation is two-way, but only one way at a time (as with CB or ham radios); each side waits for the other to finish before beginning to talk. A full-duplex link lets both sides send information simultaneously—as with a telephone, which lets either side interrupt at any time.

Echoplex refers to the source of the characters that appear on your screen when you type at the keyboard. The choices are *local echo* (your modem or software echoes the characters as you type them) or *remote echo* (the computer you're talking to echoes the characters back to you before you see them on the screen). Remote echo can serve as a primitive error-checking feature. If the character shows up on your screen correctly, you can be reasonably sure that the other side received it correctly.

On the overwhelming majority of pro-

ASYNCHRONOUS TERMINAL EMULATION

What types of terminals should your communications package emulate?

Many asynchronous communications programs include a feature called terminal emulation. These programs will still let your PC act like a garden-variety terminal that gives you one-line-at-a-time control, but they also open the door to more-sophisticated communications. Choosing a communications package that includes the emulation capabilities that best meet your particular needs can be tricky. Here are some points to consider.

It helps to know a little about the terminals your PC can emulate. The most popular of the many standard terminals in use in the computer industry today are Digital Equipment Corp.'s VT100 series, IBM Corp.'s 3101 series, TeleVideo Systems' 912 series, and Lear Siegler's ADM-3 series. These terminals have found their way into many mini and mainframe computer systems. Because the terminals are so common, many minis and mainframes have been programmed to control one or more of them on a full-screen basis, allowing users to do full-screen, as opposed to line or character, editing.

If the host system knows how to control the particular terminal you choose to emulate, you can typically use the cursor position keys, tab between input fields, and set many different screen attributes, such as highlighting, reverse video, and blinking. Some of the more advanced terminals also support some graphics capabilities, such as line drawing and plotting.

Because the system that you connect to must be programmed to understand the

protocol that these terminals use, your selection of a communications program should center on the emulation capability you need. All DEC computers understand the VT100 protocol, and so that emulation would be an obvious choice for those users with access to a VAX system. IBM systems, while mainly oriented toward synchronous protocols, do support asynchronous communications, most notably with TSO (Time Sharing Option). 3101 emulation would be a good match for this application.

The wise user will also check to make sure a program contains all terminal functions. You can usually tell by looking through the manual. Be especially careful about full emulation as opposed to partial; some programs handle the most commonly used functions, such as delete character and move cursor, but leave out the more advanced functions like block-mode transmission and graphics displays.

Most time-sharing services, such as CompuServe and The Source, allow you to specify the type of terminal emulation you are using. They will let you select from among many different types, including the ones I have mentioned. If you plan to connect to a UNIX system, you probably have a very wide range of choices. At least one UNIX implementation, acting as a host, will talk to over 200 different terminal/manufacturer combinations! You will benefit greatly from investigating the terminals your system supports before purchasing an asynchronous communications program.

—Bill Harts

grams, "half-duplex" means local echo and "full-duplex" means remote echo. And they operate in full-duplex regardless of the so-called duplex setting.

Logically, you can have any combination of duplex setting and echoplex setting.

However, as a practical matter, it's clumsy to use half-duplex and remote echo. If you're a fast typist, it's easy to get several characters ahead of your screen while the remote computer waits for you to stop before echoing the characters back.

In most PC-based communications, you can get away with a blurring of distinctions between echoplex and duplex. However, at least one program reviewed here—*Relay Gold*—maintains the distinction, offering separate settings for echoplex and duplex. And if you choose half-duplex, *Relay Gold* also lets you define the turnaround character.

■ With the send/capture approach to transferring files, each side gives commands independently; the two systems do not handshake, or exchange coordination signals.

The turnaround character is the signal you send to tell the receiving side that you're done. If you're actually engaged in half-duplex communications (as opposed to full-duplex with local echo), this is an extremely important feature.

FILE TRANSFER File transfer, the next most common communications capability, can be split into two functions: basic send/capture and the slightly more sophisticated file transfer. *Send* and *capture* are really two separate features, but you can use them together for a primitive file transfer. *Send* lets you send a file from disk in ASCII format, just as if you had typed it at the keyboard. In most programs the file writes to the screen on the transmitting side as the program sends it. The receiving end can likewise read the information on-screen as it arrives.

Capture places incoming information in a memory buffer and saves it to disk. It works equally well for saving an incoming ASCII file or typed information, making no distinction between the two. To save an incoming file to disk, you must remember to check that capture is on before the other side starts sending, or you'll miss part of

XMODEM: THE CASE OF THE CHANGING PROTOCOL

Any definition of the Xmodem protocol is sure to raise objections from some quarter. The original version was defined by Ward Christensen in the CP/M program Xmodem. It used checksum error checking and was limited to sending one file at a time. *PC-Talk* used this implementation under the name "Xmodem protocol," and it has been accepted as such by users with DOS machines. CP/M programmers, meanwhile, have developed the protocol further.

Today's typical CP/M implementation of Xmodem will first try file transfer using the more sophisticated CRC error-checking method and, failing that, will fall back on the checksum method. Many CP/M implementations will happily handle batch file transfer (as in "SEND A:*.*"). For CP/M-user types, the Xmodem protocol in *PC-Talk* is "really" Christensen protocol—as distinguished from what they consider the "real" Xmodem protocol. Some purists even argue that Xmodem is a program and that "Christensen protocol" is the only correct name for the protocol.

For DOS computers, a small but growing number of programs include CRC error checking as a choice for Xmodem file transfer. A few of these include the fallback feature for automatically choosing between the CRC and checksum approach, but most make you choose manually. Similarly, relatively few DOS programs allow Xmodem batch file transfer—though here again, the number is growing.

For this article, we decided to use the definitions that are most common in the MS-DOS world. These definitions have

the advantage of being self-explanatory. For our purposes: Xmodem uses the checksum method as implemented in *PC-Talk III*. Xmodem CRC uses CRC error checking as a separate choice in initiating a file transfer. Xmodem CRC with fallback includes automatic fallback to the checksum file transfer. Batch file transfer is a separate feature.

MORE VARIATIONS Xmodem is not the only protocol with more than one definition. Kermit, the protocol developed at Columbia University, also has several incarnations. The distinction seen most often is between a version of Kermit that can handle 8-bit data files and a version that can't.

One of Kermit's strengths is that it uses a 7-bit data length rather than the 8-bit data length of Xmodem (see *Kermit* review). This lets Kermit exchange files with mini and mainframe systems that Xmodem can't talk to because those systems require a 7-bit length. When Kermit has to send a file that needs the full 8-bit length, it uses a technique called 8-bit quoting. Basically this technique retains the 7-bit data length that Kermit needs by breaking off the 8th bit and sending it separately. The receiving Kermit puts things back together.

Several programs that use the Kermit protocol have not implemented the 8-bit quoting feature and are only suitable for sending text. Other programs have two separate Kermit options, one with 8-bit quoting and one without. If you're planning to exchange files using Kermit, you'll have to make sure that both sides use the same version.—M. David Stone

the file. With the send/capture approach to transferring files, each side gives commands independently; the two systems do not handshake, or exchange coordination signals.

Nearly as common, full-fledged file transfer capability implies handshaking between sending and receiving systems;

the receiving side knows where the file begins and where it ends. When you use a file-transfer command as opposed to a send/capture command, the information sent generally does not show up on either computer screen. Typically, the transfer is controlled by the receiving side. Even after you give the transmitting computer the

■ COMMUNICATIONS

command to send a file, it will wait for a signal from the receiving side before it starts to transmit the file.

ERROR-CHECKING PROTOCOLS

Error-checking protocols help ensure that data is transmitted correctly or, if an error is detected, that the data is resent. Almost all communications programs include file transfer with at least one error-correcting protocol. This is mostly thanks to the public-domain program *PC-Talk III*, which includes Xmodem file transfer and has become a minimal standard for DOS communications programs.

Many error-checking protocols are on

the market, most of them proprietary and available only in the programs from one software house. Such proprietary protocols are limiting, since they will not work with anyone else's programs. Fortunately, several public domain error-checking protocols are available, and any program that uses one of these can exchange files with any other program that uses the same one.

Three protocols that are currently gaining in popularity are Kermit, X.PC, and MNP. However, the protocol you'll find on most communications programs is Xmodem or some variation of it. This protocol is also known by several other names, including the Christensen proto-

col, Modem7, and CPMUG (for "CP/M User Group"); see sidebar "Xmodem: The Case of the Changing Protocol."

UNATTENDED VS. REMOTE Unattended remote file transfer is also called *unattended operation* or *remote operation*, but these terms are best reserved for other functions. Unattended remote file transfer very specifically allows users to call into a system with no one at its keyboard and initiate a file transfer. A program with unattended remote file transfer may or may not have other unattended operation capabilities or remote operation features.

Remote operation allows wider access

COMMUNICATIONS SOFTWARE: GLOSSARY OF TERMS

Asynchronous communications The most common form of communications for PCs. *Asynchronous* means that the sending and receiving machines don't have to be synchronized because each character is sent down the line with "start" and "stop" bits marking its beginning and end. In *synchronous* communications, by contrast, the need for character marking is eliminated by packaging characters into blocks and synchronizing the two systems—at least within blocks.

Bits per second (bps) A measure of communications speed in terms of individual bits—the 1s and 0s that represent the smallest unit of information a computer deals in. Common speeds are 300, 1,200, and 2,400 bps.

Capture In this simple approach to receiving text, the receiving computer holds incoming data in RAM and then saves it to disk, usually waiting for a command before doing so. The receiving system makes no distinction between text typed at the keyboard and text sent from a file.

Carrier In establishing a connection, modems begin with an audible signal that they then modulate to carry information. That signal is the carrier.

Dumb terminal A terminal that will let users only type at the keyboard and read from the screen, as opposed to a smart terminal, which allows users to perform

auto-dial and auto-log-on sequences and save data to disk. A "generic" dumb terminal mode is often called a TTY or a glass TTY: the "TTY" is short for teletypewriter, the old-style printing terminal. A glass TTY, like a printing terminal, is limited to line-at-a-time control: it lets you move within a line on-screen but not up screen to previous lines.

File transfer A function that lets computers send and receive files directly to and from disk. Unlike the simple capture function, file transfer involves "handshaking" between the sender and receiver to establish the beginning and end of each file.

Full-duplex Simultaneous two-way communications, like a telephone conversation.

Half-duplex Alternating two-way communications, like a CB radio conversation.

Handshaking An exchange of information between sender and receiver that lets both sides coordinate the transfer of data. When beginning a file transfer, the receiving side must coordinate with the sending side so that it will know where the file begins.

Modem Short for modulator-demodulator, the modem is the device that lets computers communicate over telephone lines. When sending data, it modulates the carrier wave, or codes information into it. When receiving data, it demodu-

lates, or decodes the information.

Parity A primitive approach to error checking (without error correction) in which the sending computer adds an extra bit to each character and the receiving computer checks to see if that bit is what it ought to be. Typical parity settings are even, odd, and none (when the parity bit is not used).

Protocol Any previously agreed-upon set of rules for establishing communications. Several levels of protocols are common, including modem protocols (frequency, speed, and type of modulation), flow-control protocols (determining the characters used to tell the sending computer to stop when the receiving computer is busy), and error-checking protocols (rules to acknowledge receipt of information or ask for information to be resent).

Send In this primitive approach to exchanging text files, the sending computer simply reads the file and sends the data to the modem without any coordination with the receiving computer.

Start bit See asynchronous communications.

Stop bit See asynchronous communications.

Synchronous communications See asynchronous communications.

Terminal emulation A term often used to refer to the emulation of a specific terminal, such as the VT100.

to the system. At the very least, this means that a remote caller has access to DOS commands and with it the ability to erase, rename, or copy files.

Remote operation can also let the caller run programs on the system. Well-behaved programs—those that go through DOS for screen output—will redirect data out the communications port so that the caller can see what he or she is doing. More-unruly programs like *WordStar*, *Lotus's 1-2-3*, and most other popular programs will run on the called system but are "hidden" from the caller.

Unattended operation allows the computer to "wake up" at a predetermined time to perform a predetermined task. A typical unattended sequence of tasks might include dialing the phone, logging on to a system, asking for a file or data, saving the information to disk, and logging off the system.

This feature is most often available through a script language, but some programs provide it through menu selection. The menu selection approach is generally easier for the communications novice but is also less flexible since you can't rewrite the script to match your needs.

SCRIPT LANGUAGES The most intriguing advance that communications software has made in the past few years is the showy sophistication of the script language. Such languages have been included in programs like *CrossTalk XVI* for years, but the languages in newer programs such as *Microsoft Access*, *Relay Gold*, and *Ascom IV* are advanced enough to challenge true programming languages in terms of flexibility. Script languages extend your communications capabilities—they even let you write features into the program that weren't there when you bought it. For example, the bulletin board program that runs the PC Magazine Interactive Reader Service is a script written with and running under *Ascom IV*.

TESTING TO THE LIMITS To explore the limits of these 34 communications packages, PC Magazine Labs created a list of real-life situations and benchmark tests for speed.

Several patterns emerged from the reviews. First, script languages are becoming

OUR REVIEWERS

We relied on a team of 18 reviewers to test and assess the communications software.

Christopher Barr is the SYSOP of the *PC Magazine* Interactive Reader Service and a free-lance writer.

Bruce Brown is a principal at Soft Industries Corp., a Connecticut software and hardware consulting firm, and a frequent contributor to *PC Magazine* on a variety of topics.

Robin Raskin is a New York-based free-lance writer and frequent contributor to *PC Magazine* who specializes in educational and family-computing issues. She writes for a number of computer publications and teaches technical writing at Baruch College.

Richard W. Ridington, Jr., is a consultant and principal at Soft Industries Corp. in Connecticut. He is coauthor of *Hidden Power of Lotus 1-2-3: Using Macros*.

Winn L. Rosch is a frequent contributor to *PC Magazine*.

Tom Stanton is a free-lance writer living in Manchester, New Hampshire.

M. David Stone, a frequent contributor to *PC Magazine*, has been a science writer since 1975, specializing in computers since 1981. He has written three computer books, including *Getting the Most from WordStar and MailMerge* (Prentice-Hall), and was senior contributor to three other computer books.

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ing not only more sophisticated but more common as well. Of the 34 programs tested, 19 contain at least a rudimentary script language. Ten more include at least a sophisticated macro capability that could serve much the same purpose.

We also found that the Kermit protocol is rapidly gaining in popularity. Just a year ago, it was hard to find a communications program that included Kermit as a file transfer option. Thirteen of the 34 programs tested here include some implementation of Kermit.

Finally, with a few notable exceptions such as *Microsoft Access*, *Relay Gold*, and

Ascom IV, we found that communications software is not getting any easier to use. In most cases you have a choice between easy but limited (for example, *PC-Talk III* and *PC/InterComm*) and powerful but difficult to learn (*Professional-YAM*, *Respond*). Our team of reviewers complained often of "user unfriendliness," and some programs were even characterized as "user vicious."

Choosing communications software is still very much like walking through a mine field. You can do it right, but you have to be careful where you step.

—M. David Stone

Kermit

Although not as widely used as the better-known Xmodem, Kermit, the error-checking file-transfer protocol developed at Columbia University, is used in over 200 different communications programs for MS-DOS, Apple, CP/M, Atari, and mainframe computers. The Source even has a speedy variation, called Super-Kermit, which uses "sliding windows" to maximize throughput speed.

Kermit is also the name of a simple communications software package in its own right—though its communications features are meager at best, offering just the bare framework under which the protocol can operate.

The Kermit protocol itself is the central feature of the program, mostly because of the differences between it and Xmodem. When sending a file, both Kermit and Xmodem break up the data into chunks, or packets, and both send those packets one at a time, along with error-checking information. But Xmodem requires an 8-bit data length, which can be a problem. The front ends to some mainframes and minis will only support 7-bit file transfers, and even some of the systems that can handle 8 bits will not accept something they see that matches a control code pattern.

Kermit solves this problem by using a 7-bit data length. When the data itself requires an 8-bit data length, Kermit still codes data into 7-bit length, then sends the 8th bit separately. The Kermit on the receiving end decodes the packet.

In addition to allowing file transfer between micros, minis, and mainframes, Kermit is handy for storage purposes. You can upload 8-bit executable files to a mainframe with Kermit and use the mainframe later for storage only when you download to another micro. While it's on the mainframe the .EXE file won't work, but once it's downloaded onto a machine that can interpret it, the program will work fine.

LITTLE COMMAND GEMS Notable features of the *Kermit* program include terminal emulation (VT52, Zenith-19, and VT102 are all supported), speeds from 300 to 38,400 bits per second, and little gems like a command that drops you into DOS without breaking the phone connection and wild-card support for file transfers.

In addition, some implementations of *Kermit* allow it to act as a server. Normally, to transfer a file you have to give two commands—one to the host (Send <Filename>) and one to your own system (Receive <Filename>). With a *Kermit* server, you have to give the command only once, and the *Kermit* on your system will control the server.

Kermit won't win any beauty contests, but it isn't trying. There is no color support, no directory to store frequently dialed numbers, and no auto-dial or redial feature, though you can type the redial command directly to the modem in dumb-terminal mode. *Kermit* also supports user-defined macros. Once invoked, they can log you onto a host system and start up *Kermit* on that system.

The *Kermit* program itself certainly isn't every user's dream, but the protocol might be. I'd recommend buying a telecommunications program that supports the Kermit protocol. If you are already happy with your communications programs but want the Kermit protocol capability, Columbia's price is right: it's free, except for the cost of materials (the manual is \$5). You can order directly from the university, but you might find it easier to download a copy from your local electronic bulletin board system. Although *Kermit* is free, Columbia retains the copyright. In addition, *Kermit*'s creators request that *Kermit* fans use their product only for peaceful and humane purposes.

—Christopher Johnston

PC-Talk III

If any programs for the PC can truly be called classics, *PC-Talk III* from The Headlands Press is certainly one of them. It has been around in a variety of incarnations since 1982 and continues to be one of the easiest communications programs to use. *PC-Talk III* comes complete with the program, dialing directory, parameter files, and documentation on one disk. The distribution disk even has batch files that make working copies of the program and print the documentation.

PC-Talk III mostly uses mnemonic Alt-key sequences to call up menus or parameters for communications. For example, Alt-P calls up the parameters menu, Alt-D calls up the dialing directory, and so on. A status line lists the most common commands, while pressing the Home key displays all the key sequences for easy reference. Function keys can store three different strings in combination with the Ctrl, Shift, and Alt keys. You can also define ten temporary storage areas using the Alt key and numeric characters (0 to 9).

The dialing directory stores up to 60 numbers for auto-dialing. A typical entry includes a name, number, and bit-per-second rate. You can also change the data, parity, and stop bit settings, echo, message suppression, and pacing and specify whether to strip or convert characters. Additional parameters let you specify dialing prefixes and suffixes for phone systems that require access codes. You also can



FACT FILE

Kermit, Version 2.29
Columbia University
612 W. 115th St.
New York, NY 10025
(212) 280-3703
List Price: Free
Requires: 64K RAM,
one floppy disk drive,

DOS 2.0 or later.

In Short: A bare-bones program with no delusions of grandeur. It offers only the Kermit protocol. Not copy protected.

CIRCLE 174 ON READER SERVICE CARD



FACT FILE

PC-Talk III

The Headlands Press
P.O. Box 862
Tiburon, CA 94920
(415) 435-0770
List Price: \$35
Requires: 64K RAM,
one disk drive, DOS 2.0
or later.

In Short: Somewhat limited in scope but extremely easy to learn and use, *PC-Talk III* remains a standard in telecommunications software. Not copy protected.

CIRCLE 160 ON READER SERVICE CARD

specify a modem initialization string.

A typical *PC-Talk III* session requires very little effort. Once the program is loaded you press Alt-D to dial a number and log on to the remote host. Pressing Alt-T or PgUp sends files, while Alt-R or PgDn re-

Specializing in ease of use, *PC-Talk III* uses mnemonic Alt-key sequences to call up menus or parameters for communications and program functions.

■ If any programs for the PC can truly be called classics, *PC-Talk III* from The Headlands Press is one of them.

ceives them. You must add the switch =x to the filename to send or receive with the Xmodem protocol. Additional switches for sending binary files without error checking and pacing can also be added. ASCII file transfer is echoed on-screen, while Xmodem transfer displays a block count and other Xmodem error messages. If your transmission is halted by an Xoff command, you can press Alt-O to restart file transfer.

BEHIND THE TIMES Four years ago, *PC-Talk III* had an impressive list of features, but today it's showing its age. You can't set up a list of numbers to be dialed over and over until you get an answer, and there's no script processing for unattended file transfer or remote control. Access to DOS is limited to viewing directories or files changing the logged-on drive, and deleting files. There's no command shell or callable editor—two features I've come to depend on during the past few years. File transfer is limited to ASCII text or the Xmodem protocol, with no provision to support other protocols. Many of these problems have been addressed by loyal *PC-Talk III* users. Bulletin boards and user groups have everything from simple patches to whole revisions of the original program.

Perhaps recognizing that times have changed, The Headlands Press plans on releasing a new version of *PC-Talk III* sometime this fall. Despite some limitations,

however, *PC-Talk III* remains the quintessential communications program. It gets the job done with a minimum of fuss, and at a cost of only \$35 per registered copy you almost can't afford to be without it.

—Tom Stanton

Mastercom

Mastercom shines in file transfer and backup. Between two PCs, it will copy files at a rate of 9,600 bits per second. Many use it only to back up their hard disks: they run a null-modem cable between two machines, start the transfer, and go home for the night. When they return the following morning, the backup is complete.

A limited remote feature allows file transfer with any program using Xmodem. *Mastercom* also includes a batch-transfer capability that will work only with another PC running *Mastercom*.

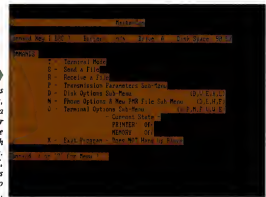
Mastercom's standard options, which include a variety of parameter settings, can all be accessed through menu selections. Typing the letter T, for example, takes you directly to terminal mode.



The program was written to support the earlier Hayes modems and does not support the Hayes extended command set. If you're using a Hayes Smartmodem 2400 or the current Smartmodem 1200, you'll have to reset some defaults for the modem to work properly in auto-answer mode. Even without the modem settings changed, *Mastercom* had no problems calling bulletin boards and downloading files using the Xmodem protocol.

Mastercom's many options can all be accessed through menu selections. Alternatively, you can operate many of the features from the command line once you become familiar with the package.

The opening menu indicates whether or not you've activated a memory buffer to collect modem input, displays the active drive, and shows you how much disk space is free. Typing the letter T takes you directly to terminal mode, where the word



■ COMMUNICATIONS

Terminal is the only text on screen if you haven't begun to communicate.

Some of the menus are awkwardly arranged. For example, the Hangup command is buried in a submenu. Backing out of submenus is a two-stage operation. You first hit Esc and then depress a Shift key so that you can type a question mark. This combination calls up the main menu. Alternatively, experienced users can type a command after pressing Esc in order to bypass the main menu entirely. The program shows its CPM heritage by ignoring the PC's function keys.

PHONE OPTIONS The Phone Operations submenu includes a handy feature: it retains the last number you dialed and displays it beside a Dial Current Number option. Other choices include Enter a New Number to Dial, Hang Up Phone, and Get Parameter File. If you retrieve a parameter file by name, *Mastercom* dials the phone number it contains automatically.

The Parameters submenu lets you set baud rate, parity, and a number of other parameters including "slow speed," which is used for sending to slower microprocessors. You can change the default command key from Esc to another key of your choice. You can also elect to have everything you type translated into uppercase.

Mastercom has a limited macro feature suitable for sending dialing commands to your modem or sending sign-on information. To define macros you have to go through three levels of menus, and you are

limited to one line of text per macro. The macros are available only in terminal mode, and you send them by typing Ctrl-A followed by the macro number (you can change the Ctrl-A command to something else if you choose).

You can save as many parameters files as you wish, storing the telephone number, password, and specific parameters for each service or remote system. This approach permits many more listings than some other dialing menus do.

In addition to dumb terminal mode, the only terminal *Mastercom* emulates is the IBM 3101. Other features include both the checksum and CRC versions of Xmodem, settings of 110 to 9,600 bps (with 300 as the default), and a maximum number of retries from 1 to infinity. DOS commands that you can run from within the program are DIR, ERASE, RENAME, CHANGE DRIVE, and TYPE. A script language is notable for its absence.

If you have a limited budget and lots of files you'd like to batch transfer automatically, *Mastercom* could be a good, inexpensive choice. Despite its shareware-style price, the developer provides free technical support. The Software Store also offers a 30-day money-back guarantee, so that you can make sure *Mastercom* will work with your equipment before you make a commitment. —**Marvin Bryan**

DynaMite

DynaMite is an easy package for almost anyone to use—as long as you have a real communications expert to set it up the first time. *DynaMite* gives you a choice of menus or direct commands for controlling the program, it lets you define function-key macros, and it includes an easily learned script language for setting up automatic log-on sequences. But getting access to this power may be a bit daunting.

The first time you use *DynaMite*, and before you enter communications mode, you must set up a "parameter file" that includes the proper modem initialization string, dial command, telephone number, parity, bit-per-second rate, and number of data bits. Unfortunately, the program doesn't tell you that it needs this stuff. It lets you go directly into communications mode from the main menu and tries to dial

using its default parameters; if that file doesn't work, it dumps you back to the main menu without explanation.

Also, *DynaMite* uses the carrier-detect line to determine when the modem is on-line. This design precludes use of simple three-wire cables, and it means that the program will not work properly if your modem's carrier-detect option is "forced true." Before starting up, you must make sure you have the right cabling and carrier-detect option; otherwise, you will find yourself back at the main menu every time you try to establish a connection.

All this information, including the proper values for the most popular modems and services, can, however, be found in the manual if you know what you're doing. And once these parameters have been set up, subsequent communication is much easier.

DynaMite includes support for almost every terminal known to man, including Telex terminals. In each case, the special function keys are mapped onto those of the PC's keyboard. It supports all of the common file-transfer protocols (Xmodem, Xmodem CRC, Ymodem, Ymodem CRC, Kermit) as well as a proprietary protocol, MITE. *DynaMite* doesn't support transfer of binary files under the Kermit protocol, but batch-mode operation is available for MITE and both versions of Xmodem and Ymodem. Unfortunately, with data that is not buffered, each block is written to disk before the next block is sent. This considerably slows down file transfer on floppy-based systems, especially with Xmodem.

DynaMite commands can be entered when on-line, either directly or from menus. It allows DOS commands to be entered; however, the program does not handle DOS errors very well. During testing, when receiving a file too large for the available disk space, *DynaMite* lost the sectors already allocated to the file and left the filename in the directory with a length of zero. Only a CHKDSK command restored the lost disk sectors.

To make command entry easier, *DynaMite* lets you create function-key macros in the parameter file that allow common commands, including passwords, to be defined separately for each on-line service. One nice feature is that the parameter files

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magazine

FACT FILE



Mastercom
The Software Store
706 Chippewa Sq.
Marquette, MI 49855
(906) 228-7622
List Price: \$49
Requires: 128K RAM,
one disk drive, DOS 2.0

or later.

In Short: Best-suited for file transfer, *Mastercom* emulates only one terminal but permits uninterrupted downloading of tagged files. Not copy protected.

CIRCLE 653 ON READER SERVICE CARD

can be password protected. Although only the function-key definitions are encrypted, this is sufficient to keep valuable passwords from prying eyes.

DynaMite includes a simple editor that can be brought up at any time, an especially useful feature for preparing text files for upload. For downloading text, *DynaMite* has a Capture feature that can be toggled on and off at any time. The Capture buffer can be easily saved to a disk file with a separate command.

SCRIPT LANGUAGE For more-sophisticated operation, *DynaMite* includes a script language called Morse. Using the built-in editor, you can create a default Morse file that automatically takes over when a connection is established and handles automatic log-on. You can also specify a Morse file on the command line. Since Morse can read the clock, unattended operation is possible. Although Morse is easy to learn, it has only limited string-handling capabilities. And I found that when something unexpected arose, Morse scripts tended to get out of sync, generating unpredictable results.

DynaMite supports a remote operation mode, from which you can transfer files in either direction and use DOS housekeep-

ing commands. You can't run programs from the remote terminal, but you can run *DynaMite*'s DOS utilities and can change any of the settings, including file-transfer protocols and modem parameters. Although a script file can be specified to begin as soon as the remote system goes on-line, since Morse's string handling is so limited, you can't enforce a password. Anyone who happens to dial into the waiting system can do anything he wants, including delete the entire disk.

MAXIMATE AND MAXIMATE PLUS In addition to *DynaMite*, Mycroft Labs markets two other packages that are lesser versions of *DynaMite*: *MaxiMite* and *MaxiMite Plus*. *MaxiMite Plus* does not support as many different terminal types as *DynaMite*, nor does it support Morse files. *MaxiMite* offers still fewer features, emulating only VT100 and standard dumb-terminal modes. Both packages include the function-key macros and the built-in editor. Unlike *DynaMite*, both packages are also available for CPM-80 machines.

MaxiMite and *MaxiMite Plus* retain *DynaMite*'s easy-to-use flavor, and *DynaMite* has no trouble reading parameter files created for its siblings. This feature, plus the similarity of program commands, makes upgrading a breeze. If you have no need of the different terminal emulations or automatic script files, one of these less powerful packages, with their smaller price tags, may be for you.

DynaMite is designed to be used by even unsophisticated users in a setting that includes a few experts to do the installation. Once Mycroft Labs adds string han-

dling to its script files and improves its error-handling capabilities, *DynaMite* will be a truly dynamite communications package. —Stephen Randy Davis

PC-Dial

PC-Dial, from Jim Button's ButtonWare, is easy to install and use, inexpensive, and full of features. This TTY-emulation package handles most basic communications needs, but it also supports some features that more-expensive programs have, such as speeds up to 9,600 bits per second and user-defined scripts and macros. The manual is well written and can be understood by beginners as well as those more experienced with communications programs.

User-definable scripts are the key to *PC-Dial*'s simplicity. When you first run *PC-Dial*, it loads a batch file that opens the communications port, sets the parameters, and then drops you into terminal mode. You can type direct commands at this point or send a prewritten script.

The scripts, generated with *PC-Dial*'s Mini-Editor, use embedded commands and macros (*PC-Dial* calls them Smart Keys). You may create up to 12 macros in total, each unlimited in length. Before you can use a macro, you must define it either in the batch file you load at the start or in the script file. A typical script file might contain commands to dial a remote system, connect, log on, issue a password if necessary, scan for messages, and ask for files to be downloaded. There is no limit to the number of scripts you can make.

Once connected to a host, *PC-Dial* can receive files in one of three ways. If your



FACT FILE

MITE

DynaMite, Version 4.0
Mycroft Labs
P.O. Box 4106
Tallahassee, FL 32315
(904) 385-4442
List Price: \$99.95
Requires: 256K RAM,
one disk drive, DOS 2.0
or later.

In Short: An easy-to-use but hard-to-set-up program supporting popular terminals and protocols. *MaxiMite* and *MaxiMite Plus*, subsets of *DynaMite*, offer fewer features and lower prices. Not copy protected.

MaxiMite, Version 4.0

List Price: \$49.95
Requires: 128K RAM, one disk drive, DOS 2.0 or later.

MaxiMite Plus, Version 4.0

List Price: \$74.95
Requires: 128K RAM, one disk drive, DOS 2.0 or later.

CIRCLE 866 ON READER SERVICE CARD

This screen demonstrates *PC-Dial*'s batch file, which is executed when you load the program. Also shown here: a "Smart Key" is defined as a macro (SMART (1) *PC Magazine*).



■ COMMUNICATIONS



Communications Programs: Summary of Features

Communications Programs: Summary of Features														FILE TRANSFER					
Product/Manufacturer	Price	Product parameters	On-line help	Command strategy	Modem data	Fully automated dialing	Auto- dialing	Max. no. of repeat calls	Exit to DOS without losing connect.	DOS functions modeled	Build-in text editor	Designate any editor	SPS settings	Telephone	DUPLEX	Full dial	Turnaround character	LOCAL control	Options
Kermit Columbia University	Free	●	●	Ctrl- or Alt- key combinations, command line	●	●	0	●	●	●	●	45-19,200	Local	●	●	●	●	●	Kermit protocol
PC-Talk III The Headlands Press	\$35.00	●	●	Menus, function key commands, Ctrl- or Alt- key combinations	●	●	1	●	●	●	●	300-2,400	Local and Remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only)
Mastercom The Software Store	\$49.00	●	●	Menus	●	●	Unlimited	●	●	●	●	110-9,600	Local	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, batch Xmodem
MaxiMite Mycroft Labs	\$49.95	●	●	Menus, command line	●	●	10	●	●	●	●	110-9,600	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), batch Xmodem, Kermit, Crosslink, Hayes
PC-Dial Buttonware Inc.	\$59.95	●	●	Menus, function key commands, Ctrl- or Alt- key combinations, point and shoot, com- mand line	●	●	Unlimited	●	●	●	●	110-9,600	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC
BHCom BIT Software Inc.	\$65.00	●	●	Menus, function key commands, point and shoot, command line	●	●	Unlimited	●	●	●	●	150-9,600	Local	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, batch Xmodem, Ymodem
MaxiMite Plus Mycroft Labs	\$74.95	●	●	Menus, command line	●	●	10	●	●	●	●	110-9,600	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, batch Xmodem, Ymodem, batch Ymodem, Kermit, Mite
Get! Cynet Technologies Inc.	\$89.95	●	●	Menus, function key commands, Ctrl- or Alt- key combinations	●	●	9	●	●	●	●	300-9,600	Remote	●	●	●	●	●	Send/Capture, Xmodem CRC with fallback
BackComm LaSalle Micro Inc.	\$95.00	●	●	Menus, command line	●	●	999	●	●	●	●	50-19,200	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), X-PC
The Micro Link II Wordcraft	\$99.00	●	●	Menus, command line	●	●	Unlimited	●	●	●	●	300-9,600	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC with fallback, batch Xmodem
ASCI Pro United Software Industries	\$99.95	●	●	Menus	●	●	Unlimited	●	●	●	●	50-38,400	Remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, batch Xmodem
DynaMite Mycroft Labs	\$99.95	●	●	Menus, command line	●	●	10	●	●	●	●	110-9,600	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, batch Xmodem, Ymodem, batch Ymodem, Kermit, Mite
MEX-PC NightOwl Software Inc.	\$99.95	●	●	Menus, function key commands, Ctrl- or Alt- key combinations, command line	●	●	0	●	●	●	●	300-57,600	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, batch Xmodem, Kermit, CompuServe A, Modem 7
SideTalk Lattice Inc.	\$119.95	●	●	Menus, function key commands, Ctrl- or Alt- key combinations, command line	●	●	Unlimited	●	●	●	●	110-57,600	Local	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, Ymodem, batch Ymodem, ASCII
PC-InterComm Mark of the Unicorn Inc.	\$124.00	●	●	Menus, function key commands, Ctrl- or Alt- key combinations, point and shoot, status line	●	●	Unlimited	●	●	●	●	50-19,200	Local	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Kermit, Crosslink, Hayes, PC InterGames
Omniterm 2 Lindbergh Systems Inc.	\$129.95	●	●	Menus, function key commands	●	●	Unlimited	●	●	●	●	Unlimited	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only)
Professional-YAM Omen Technology Inc.	\$130.00	●	●	Menus, function key commands, Ctrl- or Alt- key combinations, command line	●	●	Unlimited	●	●	●	●	Unlimited	Local and remote	●	●	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, batch Xmodem, X-PC, Kermit

●—Yes ○—No †The user may build his own script file to support password and various remote file transfer options. — Indicates Editor's Choice.

■ COMMUNICATIONS



Communications Programs: Summary of Features

Product/Manufacturer	Price	Predefined parameters	On-line help	Command strategy	Manual aid	Fully automated auto-dial/answer	Store password	Max. no. of input data	Sets to DOS without a command	DOS functions included	Built-in text editor	Designate any other	BPS settings	Echo/echo	DUPLEX			Transmission character	X-ON/XOFF flow control	Options
															Full	Half	None			
PFS: Access Software Publishing	\$149.95	●	●	●	●	●	●	Unlimited	○	●	○	○	300-9,600	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only)
Hyper Access Bilgreen Inc.	\$149.00	○	○	●	●	●	●	20	○	●	○	○	50-19,200	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, Kermit
Smartcom II Hayes Microcomputer Products Inc.	\$149.00	●	●	●	●	●	●	10	○	●	○	○	110-9,600	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only), Hayes
Telipeac US Robotics	\$149.00	○	●	●	●	●	●	10	○	●	○	○	110-38,400	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, user-defined proprietary
Telios Genesys Corp.	\$149.95	●	●	●	●	●	●	Unlimited	○	○	○	○	110-9,600	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only), Kermit
Ascom IV Dynamic Microprocessor Associates Inc.	\$195.00	●	●	●	●	●	●	Unlimited	○	●	●	●	500-19,200	Local	○	○	●	●	●	Send/Capture, Xmodem (checksum only), ASCOM IV, user-defined proprietary
Crosstalk XVI Microsoft Inc.	\$195.00	●	●	●	●	○	●	10	○	●	○	○	110-115,200	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only), X-PC, Kermit, Crosstalk
Lync Norton-Lambert Corp.	\$195.00	●	●	●	●	○	●	Unlimited	○	○	○	○	Automatic	Local and remote	○	○	●	●	●	Send/Capture, Xmodem (checksum only), Batch Xmodem
PTCL Phoenix Software Associates	\$195.00	○	○	●	●	○	○	Unlimited	○	○	○	○	300-9,600	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Xmodem CRC, Kermit, Modem 7
Respond Software Synergy Inc.	\$195.00	●	●	●	●	○	○	Unlimited	○	○	○	○	110-19,200	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback
Microsoft Access Microsoft Corp.	\$200.00	●	●	●	●	○	○	○	○	○	○	○	50-8,600	Local and remote	○	○	○	○	○	Send/Capture, Xmodem, X-PC
Relay Gold VM Personal Computing	\$250.00	●	●	●	●	●	●	9	○	○	○	○	50-8,600	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Kermit, Relay Gold
Miracle Micro-Systems Software	\$290.95	●	●	●	●	●	●	99	○	○	○	○	300-9,600	Local	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Xmodem CRC
Enable The Software Group	\$395.00	●	●	●	●	●	●	Unlimited	○	○	○	○	110-19,200	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Enable
Framework II Ashon-Tate	\$695.00	●	●	●	●	●	●	99	○	○	○	○	110-9,600	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, Batch Xmodem, Crosstalk, Hayes
Symphony Lotus Development Corp.	\$695.00	○	○	●	●	○	○	Unlimited	○	○	○	○	110-8,600	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only), Xmodem CRC, Xmodem CRC with fallback, WINP, X-PC
Smart Software System Innovative Software Inc.	\$695.00	○	○	●	●	○	○	9,999	○	○	○	○	110-9,600	Local and remote	○	○	○	○	○	Send/Capture, Xmodem (checksum only)

●—Yes ○—No †The user may build his own script file to support password and various remote file transfer options. **PC**—Indicates Editor's Choice.

REMOTE FILE TRANSFER

Advanced features	Through menus	Through batch files	Through macros	Password protection	Single password	Offered passwords for different users	File transfers work with	Remote operation	Access to DOS level	Run programs remotely	Script language	Learn feature	User-defined menus	Macros	Memory-resident	Background file transfer	Simultaneous two-way transfer	DEC VT 52	DEC VT 100	IBM 3101	Other
Unlimited	•	•	•	•	•	•	Send/Capture, Xmodem	•	Limited	•	•	•	•	•	•	•	•	•	•	•	•
20	•	•	•	•	•	•	Send/Capture, Xmodem	•	•	•	•	•	•	•	•	•	•	•	•	•	•
9	•	•	•	•	•	•	Send/Capture, Xmodem	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Unlimited	•	•	•	•	•	•	Send/Capture	•	Limited	•	•	•	•	•	•	•	•	•	•	•	•
Unlimited	•	•	•	•	•	•	Send/Capture, Xmodem	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Unlimited	•	•	•	•	•	•	Send/Capture, Xmodem	•	•	•	•	•	•	•	•	•	•	•	•	•	•
255	•	•	•	•	•	•	Send/Capture, Xmodem	•	Limited	•	•	•	•	•	•	•	•	•	•	•	•
10	•	•	•	•	•	•	Send/Capture, Xmodem	•	•	•	•	•	•	•	•	•	•	•	•	•	•
9,999	•	•	•	•	•	•	Send/Capture, Xmodem	•	Limited	•	•	•	•	•	•	•	•	•	•	•	•
9	•	•	•	•	•	•	Send/Capture, Xmodem	•	•	•	•	•	•	•	•	•	•	•	•	•	•
10 default	•	•	•	•	•	•	Send/Capture, Xmodem	•	Limited	•	•	•	•	•	•	•	•	•	•	•	•

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Fourth, it is the best there is. There are several other boards on the market. Some are priced about the same as the **BREAKTHRU 286** and some are cheaper. We at PCSG have compared them all, but there simply was no comparison. What we discovered is that many cards being sold offer only a marginal speed up in spite of their claims. We found some to be merely versions of the obsolete 8088 or 8086, and others to be just poorly engineered. The 8MHz **BREAKTHRU 286** is unequivocally the best executed and most completely reliable speedup board manufactured today.

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FACT FILE



PC-Dial
ButtonWare Inc.
P.O. Box 5786
Bellevue, WA 98006
(800) J-BUTTON
(206) 454-0479
List Price: \$59.95

Requires: 256K RAM.

one disk drive, DOS 2.0 or later.

In Short: An inexpensive program that allows you to create custom scripts and macros. Not copy protected.

CIRCLE #79 ON READER SERVICE CARD

parameters are set to 8 data bits, *PC-Dial* will ask you to choose ASCII, Xmodem, or Xmodem CRC protocol. If you are connected at any other data-bit length, you may receive files only by ASCII. In file-receive mode you may specify any drive and any filename.

ButtonWare's support is good; the technical staff answered the telephone promptly and addressed my questions immediately. *PC-Dial* is a reliable low-end communications program with something extra—its useful script language—that you probably wouldn't expect to find at this price.—**Christopher Barr**

BitCom

BitCom is a program of the "P" variety: plain but powerful. You don't get fancy packaging or hand-holding documentation; you do get a program that is packed with features. For the novice, the program contains a question-and-answer setup menu. For the more experienced user, it contains a full script language. Ultimately, complicated scripts can be initiated directly from the DOS prompt.

Because the program's script language is short on such sophisticated features as subroutines and loops, using *BitCom* is like building a house without power tools. The results may be the same as with some more-powerful programs, but getting the structure set up could kill you.

BEGINNER'S PROGRAM *BitCom* shines at the beginner's level. It is not copy protected and can be installed in moments.

Type "BitCom" at the prompt and a four-feature main menu appears. Choosing "Select/edit phone numbers" brings you to your working list of phone numbers. Move the cursor to the phone entry and activate a communications procedure (dial, answer, establish an immediate connection without a modem, or show a complete parameter menu) with a single keystroke.

■ *BitCom* shines at the beginner's level. It is not copy protected and can be installed in moments.

To add a new entry, you fill out a blank *BitCom* Communications Parameters screen in the form of a 33-field database record.

The database menu is comprehensive, easy to set up, and sufficient to accommodate the needs of most communications users. The parameters specified in the menu become more potent when you incorporate them into a script. For example, on the menu, each record has an identifier that the program assigns (although you can choose the ID number yourself if you want), but the number is meaningless unless you incorporate it into a script. In addition, these menu parameters are easily incorporated into an auto-log-on file that you can initiate

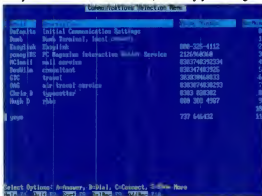
from the DOS prompt.

Many of the menu fields, such as bit-per-second rate, parity, and stop bits, are selected through a toggle, an approach that simplifies matters for a novice. In most cases, novices can also get by with only filling in the first eight fields of the menu, leaving the remainder set to default conditions. User-definable menu items allow you to ignore certain cable connections, assign keys to manage items such as the "snapshots" of the screen to printer or file, strip control codes and high bits, and build in delays and redials.

BitCom's script language has a complete set of communications features but lacks programmable control structures. This shortcoming makes complicated scripts possible but difficult. The only control structure in the language is a Goto, and so scripts get very convoluted if they are long. In testing *BitCom*, I ran lengthy scripts from the DOS prompt that allowed me to log on, transfer files, and receive and send mail with a host of built-in conditionals such as redialing and delay times. User-definable menu creation and remote operation of the computer were impossible.

UNUSUAL FEATURES The program has several unusual features. It supports four serial ports, even though most DOS machines don't use ports 3 and 4; lets you access DOS with a single key from the main menu; and supports a 132-column display. The program disk includes valuable sample script files. *BitCom* has no built-in editor, but I enjoyed having the

From *BitCom*'s phone number selection menu, you move the cursor to select a communications procedure such as dial, answer, establish connection without modem, or show parameter menu.



■ COMMUNICATIONS

freedom to use my personal favorite.

Some features are not well implemented. I found *BitCom's* VT-100 emulation unacceptable—it filled the screen with garbage characters. Also, the documentation claims that *BitCom* supports six different protocols, yet you can assign only ASCII or Xmodem through the menus and Ymodem as a batch process.

Program extension names and the manual differentiate between two kinds of scripts, which *BitCom* calls script files and action files. Script files supposedly are invoked before on-line connection; action files after connection. I tend to create scripts that incorporate the two, logging on and performing some chore. In reality it didn't seem to matter which I chose, but I wasted time pondering the procedure.

BitCom's manual is brief and confusing, documenting over 100 script-language variables and commands in less than 10 pages. The manual contains no index and only a poor excuse for a table of contents. An appendix offers the decimal table codes, but they don't do you much good because the program requires hexadecimal input. The on-line help messages are not so much context-sensitive help as they are expansions of the terse manual. It's probably best to read the help messages as text files.

Error detection is poor because *BitCom* is unable to do anything when a situation such as a disconnection occurs. The program relies on text printed out by the modem, and it ignores the more-reliable hardware signals. For example, *BitCom*

dropped a connection when it saw the text "No Carrier" typed by the host.

When I forgot to turn on my modem, *BitCom* didn't know it and froze while trying to establish a connection. When I misspelled the Select command in my script, an error message told me I was missing a semicolon. A missing parenthesis in my file transfer script caused *BitCom* to abort without any error message.

You can't have the world for \$65, but *BitCom* needs some attention before it can be really useful. A learning mode, accurate error messages, and less-terse documentation are crucial. Company support is excellent, and the promise of future releases makes me hopeful. *BitCom* is an impressive skeleton, but it needs a little flesh.—Robin Rankin

Get!

Get!, from Cygnal Technologies, is a memory-resident communications program designed for users who actively use MCI Mail and other services but are tired of logging themselves onto a network to check stock quotes or electronic mailboxes. *Get!* does all this automatically in background mode and signals you if there is any mail.

You load *Get!* into the AUTO-EXEC.BAT file on power up, where it takes 72K bytes of RAM (Cygnal recommends having 192K free). It's then accessed with a "hot key"; Alt-G is the default, but you can change it.

Telling *Get!* when to check a service is easily defined in the configuration menu. You can tell *Get!* to check at specific times, at timed intervals, only when *Get!* is loaded, or all three. *Get!* retries nine times at 5-minute intervals.

Get! has an assortment of user-tailorable features, including password protection and predefined mailbox scripts. Currently, *Get!* ships with scripts for ATT Mail, CompuServe, Gem, Genie, G.E. Quick-comm, GTE Telemail, IRC, ITT Dialcom, MCI Mail, OnTyme, Source Mail, and Western Union EasyLink. *Get!* is equipped with an easy-to-use script editor and you can define your own scripts for other services or electronic bulletin board systems. You can also define your own scripts by capturing a session to disk and

then editing in a word processor.

File transfer in *Get!* can also be handled from terminal mode (dumb terminal, VT52, VT100, and TeleVideo—take your pick). Both ASCII send/capture and protocols are supported (Xmodem, Xmodem CRC, and Ymodem).

There is a neat little text editor built into the program for on-line editing that pops up at a keystroke when you're logged in. This is handy because most networks have primitive editors. *Get!'s* editor can feed text right into an electronic envelope.

PREDEFINED PARAMETERS *Get!* predefines communications parameters in four different lists of settings, which cover 90 percent of common communications. These predefined settings are great for telecommunications novices since there is nothing to worry about except the bit-per-second rate, but power users who want to change parameters will have to key in their choices instead of using the changeable menu option.

In its current version, *Get!* is less than wonderful. The program doesn't "get" much of anything. It does check a mailbox and lets you know if there is mail waiting. But laying hands on that mail is another story entirely. You must toggle into *Get!*, tell the modem to hang up the phone and hit F9 (auto-log-on), and then *Get!* calls up the service again and lets you log on by hand. Finally, you can get the mail. Why can't it turn over control to users while

PC MAGAZINE FACT FILE



BitCom
BIT Software Inc.
P.O. Box 360619
Millipitas, CA 95035
(408) 262-1054
List Price: \$65
Requires: 256K RAM,
one disk drive (hard disk
recommended), DOS 2.0 or later.

In Short: A low-cost communications program that includes fully prompted setup menus for beginners and a comprehensive but terse script language for more-experienced users. Not copy protected.

CIRCLE 69 ON READER SERVICE CARD



FACT FILE



Get! Version 1.0
Cygnal Technologies
Inc.
1296 Lawrence
Station Rd.
Sunnyvale, CA 94089
(800) 621-4299
(800) 331-9113 (in

Calif.)

List Price: \$89.95

Requires: 192K RAM, two disk drives,
DOS 2.0 or later.

In Short: A RAM-resident communications program that is flashy, easy to use, but not as efficient as it could be. Not copy protected.

CIRCLE 67 ON READER SERVICE CARD

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Even in the midst of communications, HyperACCESS lets you run your other DOS software or use your computer's DOS commands. And HyperACCESS is so well-behaved, it can also run under Windows, TopView, DESQview or DoubleDOS, concurrently with other programs.

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System Requirements: IBM PC, XT, AT, or compatibles. 192K RAM minimum.
PC-DOS 2.0 or greater. (Separate 2-100 version.) **Net copy protected.**

*Certain programs are incompatible with remote use.

CIRCLE 332 ON READER SERVICE CARD

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■ COMMUNICATIONS

they're still on-line the first time?

Once you log on to the system and download mail messages, *Get!* drops you into DOS instead of bringing up a main menu. If you have six different mailboxes that have mail waiting, you need to go back in, retrieve the mail, get kicked out of *Get!*, go back in, and so forth.

Get! is flashy, easy to use, and well documented, but it is not very tailorable when it comes to the extras. For instance, color monitor users have no way to change the predefined on-screen colors. The main screen is basic blue, but once in terminal mode, the screen looks flashier awash in satanic black and red.

But this is the first version of *Get!* on the market, and so Cygnet hasn't taken knocks from its users, though it should have worked out some of these problems in beta testing. Cygnet insiders advise me that most of the problems I've listed here will be cleared up in Version 2.0, which is due out this month. Until then, hold onto your money but stay tuned for Version 2.0. —Christopher Johnston

BackComm

LaSalle Micro's *BackComm* may prove to be the Arnold Schwarzenegger of communications software. It's powerful, flexible, and makes feats of strength look easy, but you can get into trouble fast unless you learn how to give orders carefully.

I found *BackComm* exciting because I'm a sucker for memory-resident programs. The prospect of having my MCI

Mail checked and saved to disk while I work on a spreadsheet sounded like a way to squeeze 15 more minutes into every workday.

The ease with which *BackComm* performs this chore and the depth of the protocol settings it offers, are blessings, especially to someone who doesn't want to earn a degree in digital communications just to do unattended file transfers. If you have a working knowledge of communications, you'll be able to automate your use of Dow Jones News/Retrieval, CompuServe, and other on-line service calls within 10 minutes of installing *BackComm*; complete novices may require another 10 minutes to run through the couldn't-be-easier Customize menus.

Trouble is likely to develop if you accept the program's offer to completely automate all your communications jobs. For example, logging on to MCI Mail and saving your incoming messages to disk are as easy as pressing three function keys in rapid succession after you manually complete your first call. But if you intend to send a message next time, instead of receiving one, you may find yourself watching *BackComm* sweep into and out of the service before you can stop it. *BackComm* stores your "log on read mail save mail" routine in its command sequence language (similar to the script files in other programs) and instantly runs it when you select MCI Mail at the phone number directory. To send a message, you'll have to start a new directory entry for MCI Mail (*BackComm* can remember thousands of

entries, neatly layering them in subdirectories). The manual, which is very good at explaining installation procedures and advertising itself, offers no help on this or many of the other problems you may encounter; you have to become a regular caller to the company's help line.

If you want to take advantage of all of *BackComm's* athletic skills, you should get acquainted with the command sequence language, which LaSalle has dubbed BackTalk. Patterned after BASIC, it includes 40 commands covering file management, conditional branching, and string expressions. To help get these sequences started, a learning mode will remember your keystrokes and translate them into the appropriate command sequence. For minor editing, you can take advantage of *BackComm's* interactive debugger (similar to, and just as limited as, MS-BASIC's). Substantial editing is best done in your own word processor.

Thanks to a group of command sequences that LaSalle has packaged with *BackComm*, the program can set up a simple bulletin board. I was able to get one up and running in a matter of minutes. This proved to be the best way to do unattended file transfers. And since *BackComm* runs in the background, the host PC was not tied up by the task.

BackComm's strongest feature is its ease of customization. You can change anything from screen colors to bit-per-second rate while on-line; the range of choices is impressive (with the exception of error-checking protocols: only X.PC and Xmodem are available). This principle of ready adaptation applies to scheduling of calls (including automated file transfers) for specific times, with unlimited repetitions; logging calls made while auto-answer is left on; keeping running logs of time spent on-line with automatic calculation of user-defined rates; password protection and file encryption; and file squeezing and unsqueezing.

All this power isn't cheap in terms of system requirements. *BackComm* occupies a minimum of 180K bytes of RAM and upwards of 220K with an assortment of stored phone numbers, which takes an edge off its memory-resident advantage. A hard disk is definitely recommended for background use, though it caused no prob-



Among the on-line services BackComm provides, under different names, are DOS's DIR, CD, RENAME, TYPE, and ERASE commands.

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FACT FILE



BackComm
LaSalle Micro Inc.
1350 Remington Rd.,
Suite W
Schaumburg, IL 60195
(800) 825-1771

List Price: \$95

Requires: 256K RAM,

one disk drive (hard disk recommended),
DOS 2.1 or later.

In Short: It's very flexible, adapts to just about any communication setting, and easily automates basic communications tasks, but it requires programming skills for best use. Not copy protected.

CIRCLE 668 ON READER SERVICE CARD

lems on a floppy disk system when run in the foreground.

Considering the low price, the performance and the commitment of LaSalle Micro to improve this relatively new product (upgrades are offered to registered users for about \$12 and scheduled changes promise to make the program even more flexible), *BackComm* is sure to develop into an even more muscular package. If you want a package you can grow with and tailor to your individual taste, *BackComm* is up to the challenge. —Gus Venditto

The Micro Link II

If you liked CP/M, you'll love *The Micro Link II*. Wordcraft's *Micro Link II* is a flexible telecommunications program that uses a primitive menu system. *The Micro Link II*'s strongest feature is its control of communications settings and file transfer, but the trade-off is that it's difficult to use.

Once you learn *The Micro Link II*, the program is convenient, but the learning curve is quite steep. The tutorial at the beginning of the manual should be rewritten to accommodate more-modern modems than are assumed by the documentation. Later sections of the manual are much better, including a comprehensive command reference and several annotated examples of command sequences for different communications scenarios.

The Micro Link II is not preconfigured for any modems or modem command settings. As long as you know the com-

mands a given modem follows, you can send those commands from *The Micro Link II*. Most people today don't expect to have to learn the modem programming language. If you are able and willing to learn, however, *The Micro Link II*'s flexibility will be a boon.

The Micro Link II includes a convenient copy feature that lets you toggle file copying on and off easily. Once available system memory is full, *The Micro Link II* will store the file on disk and then resume saving it in memory. If you attempt to leave *The Micro Link II* without saving copied information, the program will prompt you to do so.

The Micro Link II does not operate in unattended mode, nor does the program have a script language as such. You can store up to nine "phrases," 60-character lines that will send commands and log-on sequences to the modem. Phrases can be used to totally automate dialing and logging on to other computer systems.

The program does not support subdirectories, nor does it allow any DOS-like commands other than those that show you the file directory of a specified disk.

The Micro Link II supports Xmodem CRC with checksum fallback and batch Xmodem error-checking protocols, qualities reflecting its CP/M origins.

The Micro Link II's manual and user interface both should be updated if this program is to be competitive. The flexibility *The Micro Link II* offers is admirable, but the required learning effort is likely to be too much for most users. —Bruce Brown



FACT FILE



The Micro Link II,
Version 2.1
Wordcraft
3827 Penniman Ave.
Oakland, CA 94619
List Price: \$99
Requires: 64K RAM,
one disk drive, DOS 1.1

or later.

In Short: *The Micro Link II* is a flexible generic telecommunications program that requires significant learning effort. Not copy protected.

CIRCLE 669 ON READER SERVICE CARD

ASCII Pro

ASCII Pro, from United Software Industries, has been around in one form or another for years. It originally showed up for 8-bit computers under the names of *Z-Term*, *P-Term Pro*, and *ASCII Express Pro* before being ported to MS-DOS. The program supports several popular transmission protocols, such as Xmodem and Kermit, and offers sophisticated macros, on-line help, and fallback error-checking (from the superior CRC method to the slightly less-reliable checksum method), all for a list price of \$99.95.

But despite its surfeit of features, *ASCII Pro* left me wondering why I would want to replace my current communications program with it, and I was hard-pressed to find answers. It's not that *ASCII Pro* won't do an admirable job at most anything you ask of it, but if you are already successfully (and happily) using something else that fits the bill, you might want to hold onto your \$99.95.

ASCII Pro can't be faulted on ease of installation. You can get it installed and running as quickly as anything else. The program is brought up by typing AEMS. The first time you execute it, *ASCII Pro* will recognize that it hasn't been installed and will run the installation program for you. Answering only two questions (type of computer and type of modem) will allow you to enter directly into the program.

To dial your first number, you simply press D from the menu screen that is presented, type in the number you want, and you are on your way. Of course, the less experienced user might want to consult the manual, but if you have used communications programs before, you should have no trouble installing and performing routine communications tasks with *ASCII Pro*.

COMPLEX MACROS

ASCII Pro breezed through most of the PC Magazine Labs tests, getting bogged down only in macro creation. The program comes with sample macros for a number of services, but I found them to be a bit confusing, and less-experienced users might well be put off by their complexity. More fill-in-the-blanks macro formats for the major services would have been nice.

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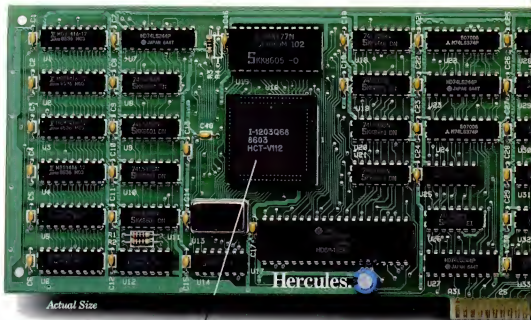
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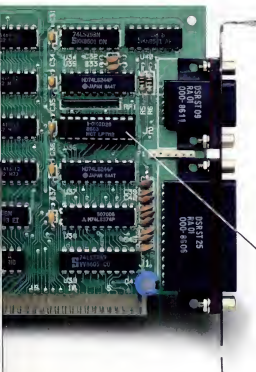
It's also at the heart of a revolution in software that's beginning right now.

Turn the page and you'll see what we mean.

*Patent applied for.



*The Hercules Printer Cable—
a \$40 value, free with each
Graphics Card Plus.*



*Another Hercules
innovation: the new
LPT112. It's a parallel
printer port on a chip.*



Lotus 1-2-3 Rel. 2 in the RamFont mode of the Graphics Card Plus: fast scrolling, a 90-column by 33-row screen and a pop-up graphics window.

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Because now you can put nearly twice as much information on your screen, scrolling right and left and up and down at speeds you'll remember nostalgically from the days of Version 1A.

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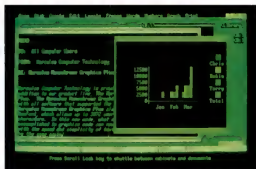
Now that RamFont is with us, you can pop up a graphics window any time you're in the mood and still keep your 1-2-3 spreadsheet in the background.

And you can do the same with Symphony™, of course.

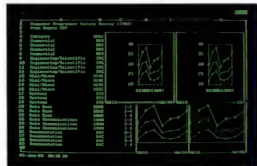
Or, if your tastes tend toward Ashton-Tate's Framework™ II, you'll be pleased to hear that you can really



The Graphics Card Plus in RamFont mode showing multiple fonts created using FontMan, a Hercules program that comes free with each Card.



Ashton-Tate's Framework II with italics and boldface and speed in the RamFont mode of the new Hercules Graphics Card Plus.



The programmable RamFont is so flexible, Symphonie can mix true text and graphics.



Microsoft Word in RamFont mode: italics, boldface and small caps—plus speed and lots of it, at last.

burn rubber with its word processor.

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Speaking of word processors, remember a couple of pages ago how we said they would be forever changed? Well, the change has already begun.

For example, the Hercules Graphics Card Plus with RamFont makes Microsoft® Word a whole new program.

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CIRCLE 198 ON READER SERVICE CARD

■ COMMUNICATIONS

Entering 1 brings up ASCII Pro's Command Summary menu, which lists the most-frequently-used commands. 2 brings a summary of more advanced commands. Neither menu needs to be displayed in order for you to execute a command.



If you do invest the time to learn the macro language, *ASCII Pro* will serve you well. You can, for example, create a set of nested macros to call three different on-line services and check and download your mail at an appointed hour, as one of the PC Labs tests required. However, this is not a task the beginner will want to tackle.

ASCII Pro's documentation is complete but somewhat dense and uninviting. In fact, although its basic features are extremely easy to learn and use and the program does certain tasks automatically, its advanced features, like the power macros and text editor, require more time and effort to master than many users might want to invest.

Still, at only \$99.95, *ASCII Pro* is a reasonable choice for general communications tasks. It is quick, simple (for basic tasks), and does possess some advanced

capabilities. Available for CP/M-80 and CP/M-86 as well as for MS-DOS, it will also facilitate transfers between vastly different computers. However, inexperienced users might find that they just don't want to penetrate the somewhat arcane world of *ASCII Pro's* macros, which would allow them to take full advantage of the program's more-promising features.

—Jon Pepper

MEX-PC

MEX-PC, or Modem Executive, from NightOwl Software offers powerful script processing and command-line control over your telecommunications. *MEX-PC* does offer a menu for simple functions, but even the documentation admits that the power is in command-line mode.

After you boot *MEX-PC*, the menu screen appears. Some command tags are obvious (Files, Phone, Xfer), while others are fairly obscure. The Conv tag calls up

the Conversation menu, which is how you reach terminal mode. Granted, communications is conversation, but I expected something more obvious. Also, some parameters are easy to change, while others are inaccessible. For example, I could not change the COM port setting without exiting the menu to command-line mode to set it, at which point I decided that I might as well stay in command-line mode since most other commands can't be entered in the menu mode.

The phone directory stores 30 numbers with a comment line. You must load other phone directory files as needed if you have more numbers; potentially you have a limitless number of entries available, as long as you remember which names are on a particular list. Phone numbers in the directory do not store parameters like the bit-per-second rate, word length, parity, and so on; these must be set before you dial the number and are reset to defaults once you've finished dialing. Unfortunately, the only way to store defaults is by "cloning" the entire program. I can easily envision five or six clones sitting around with defaults to handle various tasks.

Once you get past the menus, the program improves. The command-line interface is obviously where *MEX-PC* shines. Entering Stat or a question mark displays a screen full of parameters and switches that you can set to control the modem and screen. Unlike in the menu mode, everything is at your disposal: terminal emulations (VT100, ADM3A, DG100/200, TeleVideo 925), COM port selections, directory and path specifications, DOS commands, the COMMAND.COM shell, and



FACT FILE



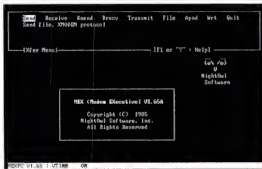
ASCII Pro,
Version 1.30
United Software
Industries
8399 Topanga Canyon
Blvd.
Canoga Park, CA 91304
(818) 887-5800

List Price: \$99.95
Requires: 128K RAM, one disk drive, DOS 2.0 or later.

In Short: A functional program that is quick and simple and has some advanced capabilities. Not copy protected.

CIRCLE 800 ON READER SERVICE CARD

MEX-PC offers limited and simplistic menu commands (pressing ? brings up help); the real power of the program is in its command-line interface.



■ COMMUNICATIONS

file-transfer protocols (Xmodem, Xmodem CRC, Batch Xmodem with relaxed timing, Ymodem, Kermit, and ASCII). You can go directly to DOS to call up text editors and spreadsheets.

If you're willing to spend the time, *MEX-PC* supports a complex script language with considerable power. The script supports string and numeric variables, Sleep and Wait statements for time control from seconds to specific dates, Gosubs and Gotos to invoke subroutines, and nested procedures that can run one within the other. "Attack dialing" can be scheduled by application, so that one script can (upon successful connection) call a second script that executes a log-on procedure. Sophisticated users can set up scripts that act as host environments for remote file transfer.

The documentation for *MEX-PC* is confusing and poorly indexed. A single book is used for both the DOS and CPM versions, and the DOS-specific subjects are buried one on top of the other, making it very difficult to find things quickly. For example, the first chapter on modem setup gives no hint as to how to select COM1 or COM2, in part because most CPM systems don't have two communication ports. Chapter 3 finally mentions that either port is usable on a DOS system.

If you are uncomfortable entering commands or writing batch files, this program will disappoint and probably discourage you. If, however, you are comfortable with programming or prefer command-line interfaces to menus, *MEX-PC* is worth a serious look. —Tom Stanton

PC EDITOR'S CHOICE



MEX-PC
NightOwl Software Inc.
Rte. 1, Box 7
Pt. Atkinson, WI 53588
(800) NITEOWL
(414) 563-4013
List Price: \$99.95

Requires: 128K RAM,

two disk drives, DOS 2.1 or later.

In Short: Command- or menu-driven telecommunications program with a powerful script file processor. Not easy to use, but worth the effort. Not copy protected.

CIRCLE 640 ON READER SERVICE CARD

SideTalk

If you're a fan of background operations, you'll like *SideTalk*. Occupying about 90K bytes of RAM, *SideTalk* patiently monitors your activity, ready to spring to life when you touch the Shift-Alt "hot key." It can also act as a standalone program, the route I recommend for floppy disk users since the program goes out to disk so often. *SideTalk* incorporates a pop-up communications menu with a phone directory and command-driven facilities. You can create sequences of commands using a text editor and then run them as a batch file.

From the DOS prompt, you can configure *SideTalk* for your type of display, allot a portion of memory to script files, and choose standalone or resident status. The initial help screen is attractively designed, with pop-up menus to help the beginner. The pop-ups require a "point-and-shoot" selection for bps rate, parity, and other parameters, which makes for slow going. A feature that would allow you to type in the first letter of the command would be a welcome addition.

SLOW LANGUAGE The program is based on a proprietary language that is used to create the shell for the program. The language is elegant, but it seems to slow down some of *SideTalk*'s operations. From the time I issue a command to activate the dialing sequence, I waited a minimum of 25 seconds for it to dial and connect.

Calling the phone directory to the screen is also slow. The program comes with a single phone listing (for the Lattice BBS service), but when I accessed the entry, *SideTalk* chugged through my entire disk. Apparently the database is a fixed-length, fixed-record affair that takes a fixed amount of time to retrieve, no matter how many or how few entries you have.

This tortoise is occasionally a real winner, since its error-handling features are especially robust. Using the *SideTalk* language's On Error and Resume commands allows *SideTalk* to keep working even when it encounters errors such as hangup. The program is configured for a number of popular modems and supports both CTS



FACT FILE



SideTalk
Lattice Inc.
P.O. Box 3072
Glen Ellyn, IL 60138
(312) 838-7900
List Price: \$119.95
Requires: 128K RAM,
one disk drive, DOS 2.0

or later.

In Short: A memory-resident communications package with its own proprietary communications language, similar to BASIC, for creating scripts. Not copy protected.

CIRCLE 641 ON READER SERVICE CARD

and RTS, so communications error-detection is maximized.

The manual is well organized but not especially easy to use unless you are already familiar with the *SideTalk* language. Most of the manual is devoted to an alphabetical index of the programmable functions. The index is also organized by function name, so you wind up trying to second-guess *SideTalk*'s command-naming strategy. A pop-up on-line manual frees you from the perils of hard copy; you can print it out if you prefer.

SCRIPTS The script language is reminiscent of BASIC: commands such as Goto, Let, Input, Gosub and If act just as they do in BASIC. Some *SideTalk* commands are functionally similar to such DOS commands as TYPE, MODE, and DEBUG. Since the language can easily create scripts incorporating loops and subroutines, it makes functions such as auto-dial, log-on, auto-answer, and file I/O simple. Features supported include passwords, redials, and unattended operations. One script I created runs in the background by sending and receiving mail and putting the incoming mail into a special file. *SideTalk*'s greatest programming defect is its inability to link the phone directory database into the script language.

The language facilitates easy menu creation. You can create as many as three windows with up to ten different entries. With some gumption, you could even use this program to create a bulletin board.

The terminal emulation mode is excep-

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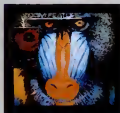
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■ COMMUNICATIONS

tionally good. The program disk demonstrates a "bouncing ball" program, written using ANSI codes, that illustrates the technique. You can even enable the retracing function to minimize annoying screen flicker.

SideTalk has its share of bugs. For instance, Alt-D, the specified hang-up command, did not work with any regularity. It hung my computer in midair more often than it hung up the phone line. The company's technical support is polite but not overwhelmingly accommodating. The staff member I spoke with told me that the support staff was not there to "write scripts" when the users were stuck. I agree, but I also remained stuck with a half-written script.

As a simple communications program, *SideTalk* is slow and awkward. As a sophisticated programmable script language, it is powerful. Because it runs in RAM, it is valuable to those who need background/multitasking-type operations.

—Robin Raskin

PC/InterComm

If you are looking for an easy-to-use program that you can pop open and start communicating with immediately, take a look at *PC/InterComm* from Mark of the Unicorn. This package emulates the Digital Equipment Corp.'s VT102, VT100, and VT52 terminals but can also handle PC-to-PC communications easily and efficiently.

PC/InterComm's ease of use is its biggest asset. When you type IC at the DOS prompt, the SETUP.IC file is loaded and drops you into terminal mode, ready to transmit or receive at 1,200 bits per second, 8 data bits, 1 stop bit, and no parity. If you have a Hayes Smartmodem or a compatible modem, hit Alt-D and enter a phone number at the prompt. This basic setting can be used with many host systems just as it is, or you can create your own customized setup.

Only two function keys are preset at the factory: F9, which calls up the Setup menu screen, and F10, which exits the program or any of the menus. Twelve Alt-shift keys are predefined for tasks that are chosen often. They have been set to dial, append, execute a DOS command, hang up, receive, save, transmit, save a screen, show

the buffer statistics and put *PC/InterComm* into echo, full, or local mode. The rest can be programmed (along with 30 more) with a limit of 127 ASCII characters stored in 38 keys. The total of all the strings cannot exceed 1,200 characters.

The main menu is called up with the F9 key, and *PC/InterComm*'s setup parameters can be customized and saved as separate files for each system you access. The nine main menu choices cover everything from the selection of the communication speed to showing the keyboard layout.

FILE TRANSFERS Choices for text file transfers include ASCII, which removes all control characters (except tabs and new lines), and Raw, which sends ASCII files with the control characters unchanged. Modem7 (better known as Xmodem), Kermit or Kermit image (which allows you to use global or wildcard commands are used for binary file transfers, although you may use them for any type of file. If you have two machines to transfer data between and both are running *PC/InterComm*, you may choose the *Inter-PC/InterComm* proprietary format, which is similar to an Xmodem transfer except that the original file size is preserved as well as the date and time the file was originally created on the transmitting computer.

Automatic PC-to-host communications are possible by using the File Protocol menu. *PC/InterComm* also offers programming commands that can be used for data transfers. These commands may be put in function key assignments or used in dialing and hang-up strings.

—Christopher Burr

**FACT FILE**



PC/InterComm,
Version 3.0
Mark of the Unicorn Inc.
222 Third St.
Cambridge, MA 02142
(617) 576-2760
List Price: \$124
Requires: 128K RAM,
one disk drive, DOS 2.0 or later.

In Short: An easy-to-use VT100 terminal emulator. Not copy protected.

CIRCLE 666 ON READER SERVICE CARD

OmniTerm 2

OmniTerm 2 has been around for a long time. It first appeared for the Radio Shack Model I, way back in 1981, and it has been available for the PC for over 2 years. Its age has three consequences: the price has fallen by half; the program is solid and apparently bug-free; and its features, particularly its user interface, are now far from state of the art.

The program is simple to install and get running. However, setting up your modem to work properly with it may be more difficult. Modem setup instructions are buried in Appendix F and not cross-referenced in the Getting Started section of the manual. Configuration details are given in general terms, with specific settings for the Hayes Smartmodem (300 and 1,200 bits per second) and half-a-dozen Radio Shack modems. Users of other modems will have to work out the requirements by referring to their modem manuals.

The system can present a menu of available "settings files," but only prior to loading *OmniTerm 2*. Switching services requires remembering the filename in which the service's settings are stored or listing the disk directory and hunting. Poor subdirectory support makes this process very cumbersome.

OmniTerm 2 has no script language. An auto-log-on sequence is limited to characters that are to be sent, embedded 1-second pauses, and waits for specific incoming strings. If any part of the sequence doesn't work as planned, the program has no way of knowing and simply continues. There is no way to branch during the process or interrupt the log-on sequence (say, to type in a secret password) and then resume.

SOPHISTICATED MACROS *OmniTerm 2* does have a sophisticated macro facility that allows up to 38 strings to be saved with any settings file. Macros can contain strings to be sent out over the phone line, commands to *OmniTerm 2*, or combinations. Macros can invoke other macros and each can be up to 70 characters long, and so you can achieve complex effects, but with considerable effort.

The program has a very complete set of character filters, which will make it attrac-

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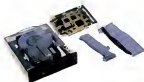
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Monochrome Graphics Card	\$195



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■ COMMUNICATIONS

tive in situations where the corresponding computer is not sending out plain ASCII text. The program contains seven filter tables, allowing single characters to be changed into any other single characters at any stage in the process: as they come in or go out in the communications line; on the way to and from disk files; on the way in from the keyboard; and on the way out to the screen or to the printer. In addition, three "special command tables" can translate any character coming from the communications line, the keyboard, or a disk file into one of the 46 *Omniterm 2* internal commands. The combination of filter and special command tables makes it possible to reconfigure the program's keyboard as desired—for example, to make it consistent with other programs you use. The filter and special command tables are not easy to use, but in the hands of a pro they can be very powerful.

Omniterm 2 is probably not the best program for a communications novice; there are many more-helpful programs around, particularly for those who have no interest in learning any of the technical details of telecommunications and who have reasonably straightforward needs. It is also not the program for sophisticated customization, user menus, and unattended operation. But for those users with special needs—such as those who want to use a PC as a not-too-sophisticated terminal to a peculiar, but regularly used remote computer—*Omniterm 2* can deliver.

—John Hellwell



FACT FILE

Omniterm 2

Omniterm 2
Lundbergh Systems Inc.
P.O. Box 3604
Ann Arbor, MI 48106
(313) 971-9733
List Price: \$129.95
Requires: 128K RAM,
one disk drive, DOS 2.0

or Inter.

In Short: The program's translation tables and filters are well suited for special needs such as using a PC as a dumb terminal connected to a remote computer. Not copy protected.

CIRCLE 641 ON READER SERVICE CARD

Professional-YAM

Professional-YAM is more than a communications program. It offers one of the most complete—and complex—communications languages this side of assembly language.

Loading and launching the program is not difficult. *Professional-YAM* is not copy protected, but the installation procedure permanently embeds a unique "SerialNumberPassword" in your copy of the program. Any copies of that copy can be traced to you, and they will refuse to talk to each other. Setting up your modem is also easy if you have one of the half dozen described in the manual. Otherwise, besides the required technical information printed in the documentation, you're on your own with your modem manual.

This program's strongest feature is its extraordinarily rich communications programming language. Situations that other communications script languages cover with one command *Professional-YAM* might address with four or five alternatives (along with numerous variations).

Other programs wait for a particular string to come in over the telecommunications line and then perform an action when it does. *Professional-YAM*, however, can scan the incoming data for up to 20 different patterns simultaneously and then take different actions depending on which pattern it detects. *Professional-YAM* can trap any kind of communications error—noise on the line, a hang-up, a busy signal—and can be instructed on appropriate responses in each case, making fail-safe communications systems possible.

Professional-YAM probably sets the record for support of file-transfer protocols. An Xmodem file transfer can be plain vanilla or can include any of these options: using CRC rather than checksum error checking; dispensing with error checking to increase transmission speed; transferring batches of files rather than one file at a time; changing the packet size to 1,024 bytes rather than the slower 128 bytes; and still others. Besides Xmodem variations there's Kermit and X.PC and the CompuServe B Protocol. *Professional-YAM* puts a lot of emphasis on file-transfer speed and error correction, and Omen

Technology claims its implementation of all these protocols will outpace the competition, particularly when telecommunications lines are defective or bits-per-second rates are very high.

User programming requires a program editor. Unfortunately, *Professional-YAM* doesn't have one built in, although any word processor (like any DOS program) can be invoked from within it. However, a memory-resident editor like Borland International's *SideKick* is a near-essential companion to *Professional-YAM*.

The user interface is not at all friendly; operating the program means learning a confusing structure of functions, commands, modes, options, parameters, "character escapes," and special keys. You enter some commands in response to an uncommunicative >>>c: prompt, others through function keys, still others through Alt-letter combinations and even a couple with Ctrl-letter combinations. Commands are terse—often single letters, followed by single-letter parameters—which makes them quick to enter but hard to remember. The manual claims that "YAM's functions are as orthogonal as possible," which might console me if I knew what it meant.

Professional-YAM's manual is probably complete, but the poor design, organization, writing, and index make it the program's worst feature. Those with patience will eventually decipher it, but no one should have to expend quite so much effort. However, Omen Technology offers excellent telephone support for the sophis-



FACT FILE

Omen

Professional-YAM
Omen Technology
17505-V NW Sauvie
Island Rd.
Portland, OR 97231
(503) 621-3406
List Price: \$139
Requires: 128K RAM,
one disk drive, DOS 2.0 or later.

In Short: A powerful communications program with a complete and complex language. Supports more than the popular protocols and terminals. Not copy protected.

CIRCLE 643 ON READER SERVICE CARD



Benchmark Tests: Communications Programs

To benchmark-test the communications programs, we timed file transfer, PC to PC, with both sides running the same program. In each case we used the same 15K-byte binary file. For ASCII file transfer, we timed a 15K text file, using text file transfer features where available or the program's send and capture features. Where available, we also tested Xmodem, Xmodem CRC, and all proprietary protocols. (*Kermit* is not included in the results because it does not offer these protocols.)

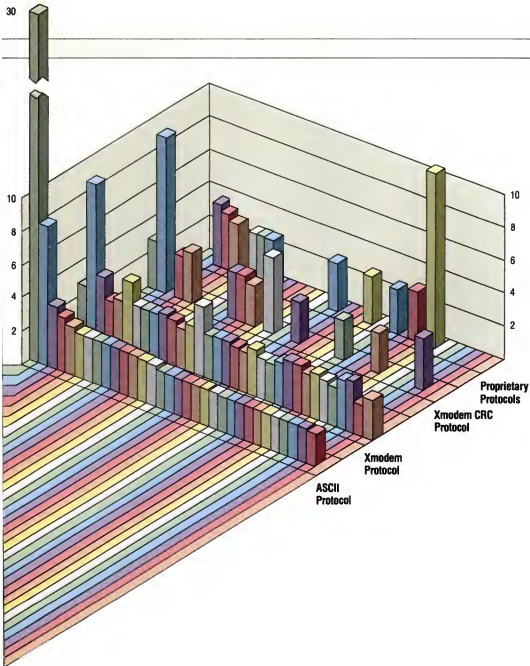
The test results give separate times for transfer time and program overhead. Actual transfer is timed from the moment the file send starts until it ends. Program overhead includes the time the program needs to set up before sending a file and the time it waits after sending the file before relinquishing control of the keyboard. The total of transfer time plus program overhead is the amount of time the computer is out of use while sending the file.

All tests were run with the Hayes Smartmodem 2400 at 1,200 bits per second. The Smartmodem 2400 has essentially the same command set as the current version of the Smartmodem 1200 and 1200B. In addition, it includes commands that let it emulate the original version of the Smartmodem 1200. By using the Smartmodem 2400, our reviewers were able to test program compatibility with all versions of the Smartmodem.

(Times given in minutes and decimal minutes)

Product	ASCII PROTOCOL			XMODEM PROTOCOL			XMODEM CRC PROTOCOL			PROPRIETARY PROTOCOLS		
	Transfer time	Program overhead	Total	Transfer time	Program overhead	Total	Transfer time	Program overhead	Total	Transfer time	Program overhead	Total
PTCL	30.00	0.00	30.00	2.75	0.13	2.88	2.78	0.11	2.89	N/A	N/A	N/A
BackComm	8.55	0.00	8.55	9.29	0.00	9.29	9.49	0.00	9.49	N/A	N/A	N/A
Lync	3.86	0.00	3.86	3.76	0.06	3.82	N/A	N/A	N/A	3.28	0.60	3.86
Relay Gold	3.37	0.00	3.37	2.56	0.01	2.57	2.62	0.01	2.63	3.43	0.01	3.44
Telnet	3.05	0.00	3.05	2.85	0.00	2.85	3.02	0.00	3.02	2.87	0.19	3.06
PFS Access	2.80	0.00	2.80	4.16	0.00	4.16	N/A	N/A	N/A	N/A	N/A	N/A
MaxiWrite	2.71	0.00	2.71	2.87	0.01	2.88	N/A	N/A	N/A	2.84	0.01	2.85
MaxiWrite Plus	2.71	0.00	2.71	2.87	0.02	2.89	N/A	N/A	N/A	2.84	0.01	2.85
Dynalite	2.71	0.00	2.71	2.84	0.01	2.85	N/A	N/A	N/A	2.84	0.01	2.85
Respond	2.69	0.01	2.70	2.83	0.21	3.04	2.79	0.06	2.87	N/A	N/A	N/A
Framework II	2.06	0.56	2.61	2.76	0.11	2.87	2.79	0.08	2.87	N/A	N/A	N/A
Professional-YAM	2.16	0.42	2.59	2.58	0.01	2.59	2.49	0.06	2.55	N/A	N/A	N/A
Mastercom	2.50	0.01	2.51	3.01	0.00	3.01	N/A	N/A	N/A	N/A	N/A	N/A
Get!	2.43	0.00	2.43	4.46	0.00	4.46	4.62	0.00	4.62	N/A	N/A	N/A
BitCom	2.34	0.00	2.34	2.78	0.06	2.84	N/A	N/A	N/A	N/A	N/A	N/A
Smartcom II	2.30	0.00	2.30	2.67	0.03	2.70	N/A	N/A	N/A	2.91	0.00	2.91
ASCII Pro	2.27	0.00	2.27	2.89	0.04	2.93	2.59	0.02	2.61	N/A	N/A	N/A
Dminterm 2	2.24	0.00	2.24	2.62	0.04	2.66	N/A	N/A	N/A	N/A	N/A	N/A
Smart Software System	2.20	0.04	2.24	2.52	0.05	2.57	N/A	N/A	N/A	N/A	N/A	N/A
Enable	2.24	0.00	2.24	2.94	0.00	2.94	N/A	N/A	N/A	2.88	0.00	2.88
MEX-PC	2.21	0.00	2.21	2.48	0.11	2.59	N/A	N/A	N/A	N/A	N/A	N/A
Hyper Access	2.21	0.00	2.21	2.51	0.00	2.51	2.51	0.00	2.51	N/A	N/A	N/A
PC InterComm	2.20	0.00	2.20	2.75	0.00	2.75	N/A	N/A	N/A	2.77	0.00	2.77
The Micro Link II	2.03	0.15	2.18	2.96	0.05	3.01	N/A	N/A	N/A	N/A	N/A	N/A
Ascom IV	2.03	0.15	2.18	2.82	0.16	2.98	N/A	N/A	N/A	2.98	0.10	3.08
StarTalk	2.18	0.00	2.18	2.57	0.06	2.64	2.49	0.06	2.55	N/A	N/A	N/A
Miracle	2.18	0.00	2.18	2.77	0.11	2.88	N/A	N/A	N/A	10.65	0.07	10.72
PC-Talk III	2.17	0.00	2.17	2.68	0.00	2.68	N/A	N/A	N/A	N/A	N/A	N/A
CrossTalk XVI	2.15	0.00	2.15	2.48	0.04	2.52	N/A	N/A	N/A	N/A	N/A	N/A
Microsoft Access	2.13	0.00	2.13	3.11	0.00	3.11	N/A	N/A	N/A	N/A	N/A	N/A
PC-Dial	2.11	0.00	2.11	3.13	0.12	3.25	3.16	0.10	3.26	N/A	N/A	N/A
Telnet	2.00	0.00	2.00	2.02	0.00	2.02	N/A	N/A	N/A	N/A	N/A	N/A
Symphony	N/A	N/A	N/A	2.56	0.00	2.56	N/A	N/A	N/A	N/A	N/A	N/A

N/A indicates that a protocol is not available.



■ COMMUNICATIONS

ticated programmer (there's a good chance your call will be picked up by the program's designer). The program is in a constant state of improvement: in one month, it went through five minor versions, from 15.65 to 15.70. Upgrades to the program can be downloaded at no cost (except for phone bills) from Omen's "Telegodzilla" host system in Portland, Oregon.

Professional-YAM is a powerful tool in the hands of the right programmer, and many communications aficionados, including Ward Christensen, inventor of Xmodem, are *YAM* enthusiasts. And, as the manual states, "*Pro-YAM* is not intended to be used as a beginner's communications program unless customer-supported for specific applications." Take a close look at it if you want to develop a sophisticated host system, or if you need to do unattended file transfers late at night, over noisy phone lines, or under highly variable conditions. *Professional-YAM* may be the only program that can do the job for you.—**John Hellwell**

PFS: Access

Going on-line couldn't be easier than this. *PFS:Access* is perfect for the person who uses a modem chiefly to connect with on-line databases, information services, and electronic mail services. *PFS:Access* has other telecommunications functions, but it shines when used to "access" on-line systems. This menu-driven program is extremely easy to learn and to use.

Preparing to use *PFS:Access* for the first time entails making a backup copy

■ If you choose, *PFS:Access* will protect files you send by using the DES (Data Encryption Standard) protection method.

and running an installation program. Since the program is copy protected and only allows one copy, you should make that copy before running the program even once. You can install *PFS:Access* up to five times on a hard disk.

Before using the program, you have to run *SETUP*, a utility to tell *PFS:Access* what modem you are using. You can choose from 33 predefined modems (including the Hayes 2400), an acoustic modem setting, or "Other." *SETUP* also configures *PFS:Access* to work with your printer and monitor.

The main menu includes six predefined services: AT&T Mail, CompuServe, Dow Jones News/Retrieval, EasyLink, MCI Mail, and The Source. To call one of these services, all you have to do is supply an access telephone number on a Service Information screen. You set modem speed on the same screen. Other communications parameters are already set correctly for the

services included in the menu.

PFS:Access's best feature is its "learn" mode for recording auto-log-on sequences. You simply indicate to the program that you want to create an automatic sign-on for a given service and it will record keystrokes until you tell it to quit.

Using services other than those already configured on the *PFS:Access* menu is also relatively easy. You can replace any of the six you don't use with those you do, but you need to know and fill in the other communications settings.

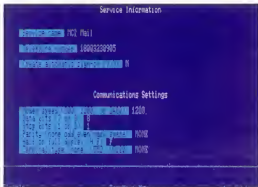
The main menu has a seventh selection. Call another PC. Ordinarily you would reserve this menu option for calling local bulletin boards or directly connecting with other computers. If you wish, however, you can configure this menu item for calling a seventh on-line service.

SIMPLE FILE TRANSFER Transferring files while connected to an on-line service is very simple; function keys tell *PFS:Access* to send or receive a file, and it prompts you for any necessary file information. If you choose, *PFS:Access* will protect files you send by using the DES (Data Encryption Standard of the National Bureau of Standards) protection method. Anyone receiving a DES-protected file must know the file password and have a program capable of decoding the file.

PFS:Access cannot be configured for unattended operation. However, you can use *PFS:Access* to set up your computer and modem for remote access. You or anyone else with a password can call the properly configured computer to upload or download files or to run a limited number of DOS commands. Two levels of passwords allow different levels of access.

Uploading and downloading files with the remote-access feature is a somewhat awkward process. If *PFS:Access* was written by a team, my impression is that one person wrote the remote-access file-transfer part and another wrote the auto-log-on learn mode feature.

A convenient feature of *PFS:Access* is that you can review screens of current and previous telecommunications sessions. *PFS:Access* sets aside 32K bytes for previous screen contents, 15 to 80 screens' worth depending on the service contacted. You can scroll through previous screens at



All functions in *PFS:Access* are initiated from the main menu. For example, choosing On-line service brings up the Service Information screen.



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FACT FILE



PFS:Access
Software Publishing Corp.
1901 Landings Dr.
Mountain View, CA 94043
(415) 962-8910
List Price: \$140

Requires: 128K RAM, one disk drive, DOS 1.1 or later.

In Short: A limited but easy-to-use program that is a good value for the user who wants to use on-line services. Not copy protected.

CIRCLE #42 ON READER SERVICE CARD

any time, even while receiving information. You can also elect to save the screen-contents memory to a file at any time.

PFS:Access is a terrific value for those who want to use on-line services. The limited remote access, file encryption, and screen-review features are also desirable. *PFS:Access's* greatest strength is its ease of setup, learning, and use.

—Bruce Brown

Hyper Access

Hyper Access has that rare combination of power and ease of use. And its reasonable price—\$149—makes it almost irresistible. Its developer, Hilgraeve, also created *Access*, the top-selling communications program for Zenith computers.

Hyper Access transfers files error free at 19,200 bits per second. It allows unattended

operation of your computer and its programs from any remote computer or terminal. You can use its script language to automate any of the procedures and create custom menus that can make the operation of the program itself invisible to users.

With *Hyper Access's* complicated password routines, you could, for example, require a caller to enter the proper password and then wait for a callback from the computer. The caller must be at the authorized phone number that accompanies the password in order to establish connection.

UNATTENDED CALLING You could also program *Hyper Access* to handle a task such as the unattended calling of a series of regional offices in the middle of the night, when long-distance charges are low, to download the latest sales figures. According to Hilgraeve, a property management firm uses *Hyper Access* to monitor office-building energy control systems automatically: a script automates the collection of data from each building and signals when maintenance is needed.

Hyper Access has a fine interactive tutorial disk that walks the beginner through the communications basics, as well as such activities as the simulated use of MCI Mail and CompuServe. The manual is comprehensive and readable.

Most users will be able to telecommunicate with *Hyper Access* by simply following the menus, without reading the manual or the tutorial. Experienced telecommunicators will appreciate the program's use of function keys to speed operation. For example, you can enter terminal



FACT FILE



Hyper Access
Hilgraeve Inc.
P.O. Box 941
Monroe, MI 48161
(313) 243-0576
(800) 826-2766
List Price: \$149

Requires: 192K RAM, one disk drive (two drives or hard disk recommended), DOS 2.0 or later.

In Short: An excellent program with many advanced features, including a comprehensive language, unattended host and file transfer capabilities, and an unusual, easy-to-use menu structure. Not copy protected.

CIRCLE #87 ON READER SERVICE CARD

mode at any time simply by pressing F10. When you're in that mode, F1 will receive or save a file, F2 will send one, F7 will hang up, and F9 will switch you to the program's main menu. These and other function key options are prominently displayed at the bottom of the screen.

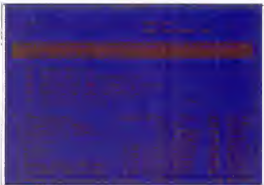
The *Hyper Access* package includes scripts for calling MCI Mail, CompuServe, Dow Jones News/Retrieval, EasyLink, NewsNet, The Source, and another computer connected by cable. The first time you use any of these scripts, you type in your name and password in response to screen prompts. The program automatically memorizes this information and furnishes it for you the second time you access that particular service.

DIALING SCRIPTS You can change or add dialing scripts at any time without programming, simply by following menus. If you need to, you can revise, in a matter of seconds, such data as the number to be called and the password.

Hyper Access specifically supports 20 different modems listed by name, but you can use any auto-dial, acoustic-coupled, or direct-connect modem. Terminal emulation includes the IBM 3101, DEC VT-52, DEC VT-100, TeleVideo TV925/950, and Heath/Zenith H-19. The program supports COM ports 1 through 4.

The program is not copy protected. You can install it in less than a minute by typing HA STARTUP and answering a few questions as to your type of modem,

Most users will be able to telecommunicate via *Hyper Access* by simply following the menus, without referring to the manual or the tutorial.



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■ COMMUNICATIONS

whether or not you have a hard disk, and what screen colors you want to use. Unless you turn off the feature, *Hyper Access* creates a file containing a log of everything that appears on your screen while you're communicating. —**Marvin Bryan**

Smartcom II

Since the first Smartmodem set standards for microcomputer communications, Hayes has been leading the field in communications hardware. It is only logical then that the same manufacturer supplies programming for its equipment. Although *Smartcom II* is a good, solid package that works well for basic business use, it has too many limitations to lead the software pack.

Smartcom II has been set up to shield the user from most of the complexities of modem use. It employs a series of nested, point-and-shoot menus and a short help line that captions each highlighted choice (longer, context-sensitive help is available through the F2 key). Every time you make a choice, beginning with the main menu, another series of choices is presented. As a result, once you've got down the basic rules, you can throw the manual on a back shelf.

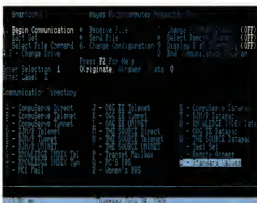
Although many basic parameters, such as screen color and default modem speed, can be set in the configuration file, most are attached to each phone number through what Hayes calls a "set." There are 26 sets available, each identified by a letter; many come preset for major services such as MCI Mail and CompuServe. All (except for option Z, which is reserved for the default) can be altered.

Each set has its own individual parameters, including function key definitions, modem speed, and protocol. These are all available to you through the main menu's Edit Set option. Any change can be either temporary or written to disk and can also be made during a session by toggling from the on-line to the menu screen.

AUTOMATED CALLING The process of making a call is almost totally automated. Once you've identified the set you wish to use (the default is either Z or the last number you called) and have chosen to "originate" a call, your work is finished.

The commands highlighted here have just been selected in preparation for calling up a service. All available

All available Smartcom II "sets" are listed below. The F2 function key calls up a context-sensitive help screen no matter where you are in the program.



The process of transferring files is equally clear: when you are on-line and ready to either send or receive files, you return to the main menu, select either the send or receive command, and then enter the appropriate filename where prompted. I found this system more unwieldy than a command line would have been, but unsure users and novices may be grateful for the extra prompting.

Smartcom II offers you two ways to automate your calls: macros and recorded batch files. Both are available from the Edit Set command choice, and, while neither option is perfectly implemented, each is a fairly simple way to make life a bit easier for yourself.

You can create up to 26 macros for each set, one of which, Z, will go into action automatically when you sign on. Hayes eases the process of macro creation by using a simple, fill-in-the-blanks screen that asks for the time-out period, the single-character prompt to wait for, the data to send, and whether or not to send a carriage return. Once you are on-line, you can access any macros line by hitting the F5 key and the letter that the macro is stored under; if you don't remember which macro is which, you must go back to the main menu and call on the macro list from there.

Smartcom II's batch service is more useful if you are dealing with a large number of commands or plan to regularly jump from one service to another. It works by a strict memory system: each batch file will register up to 500 keystrokes and will become active during one specified time in a

24-hour period. The system is easy to manage and runs through a sequence of commands with no problems. It does have one interesting glitch: *Smartcom II* insists on being the first to break a connection or else it stops the batch. Thus, you can't program a batch to sign off politely if you intend it to do any more work—if the remote service disconnects before *Smartcom II* does, you're out of luck.

Smartcom II has other limitations that may inconvenience some users. For example, its use as a remote system is limited to sending and receiving files, and both computers must use the Hayes programming.

But on the whole, Hayes's *Smartcom II* is a highly efficient, easily learned and accessible program, especially if your needs do not extend much further than the send-



FACT FILE



**Smartcom II,
Version 2.1**
Hayes Microcomputer
Products Inc.
P.O. Box 105203
Atlanta, GA 30348
(404) 441-1617
List Price: \$149

Requires: 192K RAM, one disk drive, DOS 1.0 or later.

In Short: A solid package that handles most tasks well, but with limitations that are surprising, considering Hayes' status as a leader. Not copy protected.

CIRCLE 648 ON READER SERVICE CARD

"If you are looking for one program to do it all, this is the one"

Editor's Choice PC MAGAZINE June 10, 1986*

IRS and Air Force award Enable record breaking contracts.

Following a hotly contested 10-month competition, the IRS recently announced one of the largest integrated software/hardware contracts ever granted: 15,000 laptop computers, each one powered by Enable, from The Software Group.

Now, for the first time, every IRS field auditor will have laptop ability to access home office mainframe data, search records, revise tax statements, and turn out final reports. On the spot.

Following what may be the most rigorous selection and testing process ever conducted, the U.S. Air Force awarded an even larger contract for microcomputer software and hardware. Again, Enable was the integrated software chosen.

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As one department head remarked, "When people come in for a spreadsheet, we give 'em Enable. When they come in for a database, we give 'em Enable. Word processing... we give 'em Enable. I simply can't see us outgrowing Enable."

Dow Corning zeroes in on financing opportunities with Enable.

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Glen Bertini, Dow Corning Economic Evaluator, describes Enable as "pushing PC technology to its limits, generating analyses never before possible."

One example of this is a "Capital Authorization Request" template programmed for quarterly reporting to the Board of Directors a huge spreadsheet that can produce executive-style output, manipulate 10 files and use existing Lotus 1-2-3 macros to converge on investment interest rates.

"It's not really a matter of finding ways to use Enable. I haven't found a way *not* to use Enable," commented Bertini.

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CIRCLE 391 ON READER SERVICE CARD



■ COMMUNICATIONS

ing and receiving files. However, when you consider how far-reaching Hayes's hardware has become, you can't help but wonder how the company could allow its associated software to fall even that far short. —**Barbara Krasnoff**

Telpac

Telpac, Version 3.1, extends the power of office telecomputing with plenty of sophisticated features like start-remote access and automatic call-back. *Telpac* offers great communications and screen versatility with bit-rate ranges from 50- to 38,400-bit-per-second unattended mode and color-changing capabilities from the background to the prompt. It also does everything you would expect in a telecommunications program with standard terminal functions such as talking to the modem with Hayes's extended command language, directory dialing, automatic log-ons, and the execution of simple command files much like DOS batch files.

Telpac's main screen pops automatically into dumb terminal mode, like that of *PC-Talk III*. The ScrollLock key toggles between the terminal mode and pull-down menus that can have you shaking hands with your favorite system in less than 10 minutes. The command menus are "point and shoot," which means that you use the cursor keys to select the menu choices and the Spacebar to change options. Once you are familiar with *Telpac*, you can ignore the pull-down menus and instead enter direct commands on an invisible command

line at the bottom of the screen. If you have a problem, useful and concise help is available by pressing Alt-H.

The main menu is friendly but sometimes infuriating because once *Telpac* completes a command it pops back into terminal mode. So if you hit Return to hang up the telephone, you're back into terminal mode. You then have to climb back up into the menu screen to make another call. At some points in the program, you can climb up through previous options using the Esc key, but at these key places, you can't.

Files can be transferred using straight ASCII capture mode, Xmodem, Xmodem CRC, or Telink, which is *Telpac*'s own proprietary protocol with checksum and CRC error checking. If any of these file-transfer protocols don't fit, Telink lets you define your own protocol. This feature is especially useful for transferring files to and from non-DOS-compatible computers like Apples or Ataris.

NO "HOT KEY" The program's redial features can be improved. *Telpac* automatically redials up to ten times, but there isn't a "hot key" for redialing, so you can't redial a number in the buffer from 10 minutes ago. Instead, you must go back through the menu and do the whole thing again.

Telpac's remote-access feature, however, is especially useful. The host PC is password protected with three levels of security. The lowest level allows callers to access the host computer and run *Telpac* functions in the current directory. The next highest level lets callers access all drives and directories, but they can't use DOS or run programs. The highest level lets callers run DOS functions or well-behaved programs that send their video output through DOS. This rules out programs like *J-2-3* that speed up screen output by doing an end run around DOS. The number of users, user IDs, passwords, and security levels are set in the security editor. Access to that editor is in turn controlled by a password, so that only the system operator can get in. Simple bulletin board commands like CHAT are supported as well.

Telpac's remote mode is an especially handy feature for laptop users, since they can send or receive files from their home or

office computers while on the road, eliminating frustrating problems like running out of memory space.

Except for a few irritations, *Telpac* is a strong program that's a step beyond *PC-Talk III*. The \$149 price tag is well worth *Telpac*'s features; it also comes as part of the package with the US Robotics internal 2,400-bps modem.

—**Christopher Johnston**

Telios

Genasys Corp.'s *Telios* is a rather limited, conventional communications package without fancy features. It uses a command line, has no built-in editor, and doesn't support unattended mode or remote operation. Besides the dumb-terminal mode, *Telios* emulates only the VT100 and VT52 terminals and offers only the checksum Xmodem and Kermit protocols. The program's saving grace is its powerful script language. Carefully programmed script files can lend *Telios* many of the capabilities that it otherwise lacks.

To bring up *Telios*, you enter a file-name followed by the name of a script file (which must have the extension .TLS). If you haven't yet created a script file, the program loads the default, START-UP.TLS. This file sets up the communications parameters, such as bit-per-second rate and parity. In addition, it can dial the modem, establish a connection, and log you on.

Telios uses English-like commands such as Dial, Capture, Send, Parity, and Protocol, which you enter on a command line at the bottom of the screen. A commu-



FACT FILE



Telpac, Version 3.10
US Robotics
8100 N. McCormick
Blvd.
Skokie, IL 60076
(312) 982-5010
List Price: \$149

Requires: 192K RAM
(256K recommended), one disk drive, DOS
2.0 or later

In Short: An easy-to-use, well-rounded program with strong remote-access features. Not copy protected.

CIRCLE 643 ON READER SERVICE CARD



FACT FILE



Telios
Genasys Corp.
11820 Parklawn Dr.
Rockville, MD 20852
(301) 770-4600
List Price: \$149.95
Requires: 96K RAM,
one disk drive, DOS 2.0 or later.

In Short: A conventional command-line communications program with a powerful script language. Not copy protected.

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CIRCLE 240 ON READER SERVICE CARD

■ COMMUNICATIONS

To set up parameters and initiate communication procedures in *Telios*, you enter English-like commands or three-letter abbreviations at the prompt line.

Telios Session Manager
Version 3.0
ADJUST DEFAULT SETTINGS

Enter your selection by typing the command or its abbreviation.....

File transfer...	File.....	DOS...	Serial...	End File	Comm. settings
CHASER TDFMort	STORE COLOR	BIB	TLDe	BO	AutoTolt Screen
COPIERS DIF	DELIVER LIE	GBR	COName	DDPret	Send Dial
TRIPROCAL TLDe	STATUS BRGCh	STName	Tide	Solo	Pubity PDBt
NETRIES MONE	QUIT CLGCh	STName			Filter BLSom
TCLAS TOUT	HELP	STIVE			COMs
Polystere SIDA		TYVe			
PSIGEd CLGCh					
DIFeed					

Type FILE to exit or return to the main menu

Waiting for keyboard input

nications window, in which you enter and receive on-line service commands, prompts, and text, occupies the rest of the screen. The cursor normally remains in the communications window; you must bring it down to the command line before entering a *Telios* command. Entering a null command restores control to the communications window. Context-sensitive help is available from either the window or the command line.

The *Telios* script language has the same commands as the rest of the package; you must assemble them into scripts using your own editor. Unfortunately, no learn mode is available for generating script files by recording commands. The language lets you write scripts that can distinguish between different ASCII strings. For example, the modem responses "Busy" and "No Answer" might both be handled by the same label, say, "Redial." The response "Voice!" might branch to some other label and the responses "Connect" and "Connect 1200" to a third label, which continues the log-on process.

Although *Telios* offers no password protection for script files, keyboard input at critical times is possible. Instead of incorporating your on-line service passwords into your script files where everyone can read them, you can have the files read the password from the keyboard when they execute.

Telios offers some limited DOS access. Normal housekeeping chores are possible through such DOS-like commands as Erase, Rename, Disk (change disk), and Chdir (change default pathname). Results appear in the communications window.

The distribution disk is full of sample *Telios* files, some of which fill specific functions. For example, ANSWER.TLS simulates remote operation. Unfortunately, although the *Telios* manual is generally quite acceptable, these files are not well documented, making it difficult to determine exactly what each does. Also, not all of these files work properly. The extensive *Telios* file RBBS.TLS goes through a series of questions and then generates a "file not found" message without doing anything. Not only is the error disconcerting, but the error handler gives no indication of what file was not found.

Although *Telios*'s script language is quite powerful and all the program's features facilitate the writing of useful script files, the *Telios* language cannot do everything. Power users will find *Telios* too restrictive and beginners will find that its lack of menus makes it a bit hard to learn.—**Stephen Randy Davis**

Ascom IV

Ascom IV gives you all the communication power a normal human being can use or should expect. Although there are more powerful programs, they are likely to be narrowly targeted to specific applications. *Ascom IV*, one of the most versatile communications packages available, is rich in terminals it will emulate, modems it will support, and communications parameters you can choose.

In addition, *Ascom IV* is one of those rare programs that's easy enough for the newest user to jam into a drive slot and get working but flexible and powerful enough

that the most advanced power user won't outgrow it.

Ascom IV handles just about any communications problem you're likely to encounter. Certainly, you can dial up your favorite database, either by selecting it from a menu and pressing a single function key or by taking full manual control and typing commands directly to your modem.

You can turn the tables and change your PC into a remote system or even a full-fledged bulletin board with three levels of user authorization. You can also program *Ascom IV* to call your favorite database at any appointed time and pump it for information. It will filter and substitute all 256 of those 8-bit characters both coming and going. In fact, both ASCII-to-EBCDIC and EBCDIC-to-ASCII tables are supplied with the program to smooth your conversations with mainframes.

Anyone who has had 10 minutes of experience with computer communications should be able to get *Ascom IV* running without a look at the manual. The initial screen gives a selection of functions, and you can carry out most facets of system operation through prompted menus.

In fact, the only difficulty a newcomer to *Ascom IV* might have is getting out of the context-sensitive help or backing up to a previous menu (just press End on the numeric keypad). I expected the standard Esc to be the magic key, and the brief bottom-of-the-screen help prompts did not even hint at the correct key to press. Of course, one look at the manual and the problem forever evaporates.

The command structure of *Ascom IV* is quite consistent between different modes of operation. You can shift from one mode to another without going through the main menu by pressing Alt- and function-key combinations. Direct control is available to advanced users through command mode.

The only other problem that folks too busy to look at the manual are likely to encounter is initially setting the program for a modem other than a Hayes. Although a wide variety of modems are supported, changing the default requires access to the "full" setup menu, but the initial default is "partial" setup. The wider selection at the beginning might help folks with nonstandard modems get going a bit more quickly.

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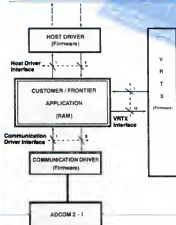
RS422/485
MIL-STD-188-114
MIL-STD-188C

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■ COMMUNICATIONS

To get the most power out of *Ascom IV*, you need the guidance of the documentation, however. The versatility of the system stems from use of its command mode, *Ascom IV's* own rather elaborate language, and script files.

As with DOS batch files, *Ascom IV* script files execute one instruction after another, each instruction drawn from the dozens of commands in the *Ascom IV* language. The power available through script files is dizzying. Not only can script files be nested up to ten deep, but they can force recursion upon the system.

BUILT-IN EDITOR The script files are easily constructed using *Ascom IV's* built-in editor. Alternately, you can create them outside of *Ascom IV* with any ASCII editor, but you cannot substitute another editor for the internal one.

In developing script files, the two reference sections included in the single, IBM-style loose-leaf binder will prove invaluable to the beginner and experienced user alike. The first section gives overall descriptions of system operation. The second is an in-depth look at each command.

Ascom IV's provisions for remote system operation are not nearly as extensive as those of programs dedicated to that use. The only functions that are permitted to the remote system are those built into *Ascom IV*: for the most part, uploading and downloading files, looking at the direc-

ry, and typing files. Only the command mode is supported. The remote operation is single ended. Only the system that is to be remotely operated needs to be running *Ascom IV*.

Ascom IV also allows limited operation of a bulletin board system, essentially an elaboration on remote operation. Three classes of users are supported with access to different *Ascom IV* functions. Passwords and electronic mail between users are also supported.

The *Ascom IV* system is powerful enough so that the only reason you'd need another program would be for more elaborate remote operation (more than just looking at and shifting files) or building an elaborate bulletin board system. *Ascom IV* offers a very usable combination of friendliness, flexibility, and full-blown power.

—Winn L. Rosch

Crosstalk XVI

Although most software manufacturers must make an uneasy compromise between ease of use and efficiency, communications software can present a special problem. The complexities of setting up protocol can drive a less-than-expert user back to the telegraph, while a totally menu-driven format can cause an impatient executive to explode.

In *Crosstalk XVI*, Microstuf has made a good attempt at a workable mean. *Crosstalk XVI* is a command-driven communications program that tries, through an extensive prompt system, to make life on-

line both faster and more comfortable for the average user.

Crosstalk XVI's main status screen is divided into three parts. The top half exhibits the protocol associated with whichever service that is presently active. The lower half is reserved for helpful user aids, such as listings of available services, on-line help, or more-complex protocol information.

A command line accepts either whole-word commands or their two-letter abbreviations. The command line is also active on the on-line screen, where the Esc key acts as a toggle. Commands can be transmitted in several ways, depending on user preference—for example, a new user who wants to change modem speed can type SPEED, and the program will respond with a listing of available options; an expert can type SP 1200 for a more immediate response.

In deference to first-time users, *Crosstalk XVI's* opening status screen has two short program files: Setup, which records modem type, COM link, and preferred speed; and Newuser, which walks you through several screens to set up the parameters for individual services. (If you're programming *Crosstalk XVI* for one of the more-popular services, such as CompuServe, Newuser will also prepare an automatic log-on script.) More-experienced callers can change or create command files on their own.

SCRIPT FILES *Crosstalk XVI* organizes all of its information through command

FACT FILE

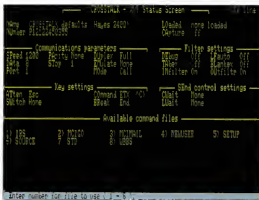
Ascom IV
Dynamic
Microprocessor
Associates Inc.
545 Fifth Ave.
New York, NY 10017
(212) 687-7115
List Price: \$195

Requires: 256K RAM, one disk drive, DOS 2.0 or later.

In Short: A complete, state-of-the-art communications package with extensive customization abilities. Menu control gives easy use, and command mode gives power users free reign. Includes remote operation, bulletin board, and unattended operation abilities. **Not copy protected.**

CIRCLE 666 ON READER SERVICE CARD

When on-line, *Crosstalk XVI* is very inconspicuous. Pressing the Esc key will toggle the cursor to the command line at the bottom of the screen. Pressing the Home key will toggle you back to the Status screen.





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Monitor/Receiver



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■ COMMUNICATIONS

(.XTK) and script (.XTS) files. Each time you save a phone number and its attendant protocol to disk, *Crosstalk XVI* creates a new command file that is subsequently listed as a choice on the status screen.

If you want to include an automatic log-on or any other macro function, you can create a script file using *Crosstalk XVI*'s built-in command language. Each script file is linked to a command file by an identical prefix; it automatically goes into play when a connection is made. *Crosstalk XVI*'s 15-command, English-based language should be fairly comprehensible to users with moderate or no programming experience. It will perform most functions required of a good macro, including sending and receiving files, allowing for loops and if-then situations, and creating question-and-answer formats. *Crosstalk XVI* does not include an editing program; however, it will automatically drop into your own designated editing software.

On the whole, *Crosstalk XVI* does its job well and includes many abilities that its peers lack. For example, its remote operation is well organized and reasonably comprehensive, and it includes a four-level system that regulates a caller's access from simply viewing the files to full use of *Crosstalk XVI*. (Unfortunately, the program stops just short of giving you remote access to DOS.) *Crosstalk XVI* also includes sophisticated features such as line character delay, a filter for incoming characters and the ability to make unattended

calls through its script language.

Considering that *Crosstalk XVI* is such a nice, flexible program, I was puzzled by Microstuf's attitude toward user help, which is less useful than it appears at first. For example, typing HE or HELP brings up a long list of commands for which there is on-line help information; however, if you don't know which command you need, the search often devolves into a sort of guessing game ("Is this the command I need? Why don't I type it and see..."). And while the manual encourages users to make full use of the script programming language, it doesn't include an adequate tutorial, and even asserts, rather tartly, that "we can not given (sic) programming courses over the phone." Frustrated would-be programmers may find that the best way to set up a *Crosstalk XVI* script file is to copy an existing .XTS file and then alter it to suit their needs.

In fact, I would especially recommend *Crosstalk XVI* for relatively inexperienced users who are feeling a bit adventurous—once you've spent a little time working out all its capabilities, you'll have both an efficient communications program and a considerable sense of accomplishment.

—Barbara Krasnoff

Lync

If your knowledge of communications programs doesn't extend beyond *Crosstalk* or *Smartcom*, then you owe it to yourself to look at *Lync*. *Lync*, from Norton-Lambert Corp., is now in Version 5.0, and it is a superior communications product. While it may lack a little of the glitzy appeal of programs like *Relay Gold*, it is chock full of features that are useful, and it will help make your telecommunications more productive.

Lync installs very easily, even without the assistance of the manual. Type LINSTALL, answer three questions about the type of computer you have, the type of modem, and which serial port it is connected to, and that's all there is to it. Although you can complete all this and start the program without ever referring to the manual (typing LYNC invokes the program), it is helpful for even the most eager, experienced users to at least glance at the documentation in order to learn *Lync*'s com-

mand terminology. For example, *Lync* uses Save where some other programs use Receive to indicate that you want to download a file from a remote source.

Hitting the Esc key brings up *Lync*'s prompt (in this case, the @ symbol), which you can follow with any of *Lync*'s many commands. Even though *Lync* is not menu driven, the program is rather easy to learn and use, even for those not experienced with communications programs. If you want to dial a remote system, you simply press Esc to reach the command prompt, followed by the command Dial (and the phone number). Similarly, you can use Save, Send, Dir (to see the disk directory), and so on.

Lync dispatches the "standard" communications tasks of sending and receiving files, either manually or automatically, with ease and efficiency. It supports unattended operation (including batch-file transfers with Xmodem and other protocols), remote operation of another system, timed sending and receiving of files, and it will also function as an on-line phone directory and dialer.

But what really sets *Lync* apart from other programs are several unusual features. First, *Lync* automatically takes care of line feeds, parity, data and stop bits, and all those other "messy" parameter settings that intimidate beginners. Communications programs should make your life easier, not more complicated, and this feature does just that. In fact, since you don't have to worry about parameter settings, about



FACT FILE



Crosstalk XVI,
Version 3.61
Microstuf Inc.
1000 Holcomb Woods
Pkwy., #440
Roswell, GA 30076
(404) 998-7798
List Price: \$195

Requires: 128K RAM, DOS 1.25 (limited use) or 2.0 or later (full use).

In Short: A good program that tries to find the medium between menu-driven and command-driven programs. It does its job efficiently and includes functions its competition lacks. Not copy protected.

CIRCLE 67 ON READER SERVICE CARD



FACT FILE



Lync, Version 5.0
Norton-Lambert Corp.
P.O. Box 93140
Santa Barbara, CA
93103
(805) 687-8896
Telex: 709170
List Price: \$195 (\$249

when used with the Vector Graphics PC)
Requires: 64K RAM, one disk drive, DOS 2.0 or later.

In Short: An excellent communications package that performs all its tasks with ease and efficiency. Not copy protected.

CIRCLE 68 ON READER SERVICE CARD

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Star Micronics	
NX-10 Dot Matrix.....	249.00
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Inverted Foldout slip-sheet

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3. Slice the folded edge
4. Close the page and slip-sheet



1. Follow instructions on the other side

Inverted Back



Gbn5lpBack-001B

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1. Follow instructions on the other side

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"They must have a lot of cancelled orders," I said.

He said yes, that in a typical month they only ship 40% of what's ordered.

That surprised me. I told him we ship 90% of our orders the next day. And we have very few cancellations.

Well, everything worked out. I apologized for our promptness. He laughed and said he'd be ready for us the next time he ordered.

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Thomas A. Penfield
Sales Manager, CMO

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■ COMMUNICATIONS

the only thing that could prevent you from not successfully making your first call with *Lync* within 10 minutes would be not having a modem.

Next, *Lync* will encrypt any file for privacy and protection while you are sending it (you simply add a /D delimiter to your Send command). Naturally, you can decrypt just as easily at the other end as a file is received (assuming you are running *Lync*, of course).

ASCII CONVERSION But, perhaps, the most appealing feature of *Lync* is its ASCII conversion capability. This feature lets you send virtually any file—.COM and .EXE files, 1-2-3 spreadsheets, word processing documents, BASIC programs—via electronic-mail services and have the formatting and formulas delivered intact. If you have ever created a beautiful word processing document and then had to convert it to a plain (unformatted) ASCII file to send via MCI Mail, you will find *Lync* to be the answer to your prayers. *Lync*'s designers have found a way to allow any file to be sent and converted back to its original form. This feature alone should make *Lync* worth the price of admission for most users.

Lync's drawbacks are few and minor. If you really feel the need for a menu-driven system, you won't be comfortable with *Lync*. Also, the screen design isn't "pretty," and the color can't be easily changed. More important, although you can create an automatic file (*Lync* calls them log files) to do such things as call three different numbers, log on, and check and/or send your mail at a specific hour each day, you must specify the time in the log file as the number of hours from the time you are executing it. That is, you must say call this number at so many hours from now—not call it at 8 p.m. Since *Lync* can be used on so many different systems (MS-DOS, TurboDOS, Apple DOS, CP/M, and so forth) and the clocks work differently, this allows log files to be transferred from system to system without reworking.

Lync is easy to use, packed with unusual features, and reliable. Particularly noteworthy is the documentation, which contains an extensive how-to section that guides you step by step through every important operation, including many that the

space of this review can't permit mentioning. At \$195, *Lync* is easily worth the money and could be invaluable for users who need its ASCII conversion features. —Jon Pepper

PTEL

One criterion for many communications programs is ease of use. You should be able to dial a number, capture messages, transfer files, and log off with a minimum of effort, preferably with the option of automating the process and scheduling unattended log ons. *PTEL* from Phoenix Software Associates features some of these and may be a good starting point for a first-time user. On the other hand, it has some annoying limitations that may not satisfy the more experienced user.

You configure the software defaults with a setup program that must be run before you start *PTEL*. The setup covers most of the defaults you would expect, including communications parameters, terminal type, default file-transfer protocol, and so on. One important setting that is missing is the modem initialization string. In an effort to be user friendly, *PTEL* takes over this task and issues its own setting based on the type of modem you select. If you happen to want any other settings, you must enter them in terminal mode from the keyboard or create a script file (*PTEL* does not have macros or programmable keys). Some settings, like the COM port, modem type, and phone directory, can be specified

only in the setup program. Thus, if you want to switch from COM 1 to COM 2 you must exit *PTEL* and run the setup program over again. This kind of setup is fine for simple modem communications, but anything beyond that requires extra effort.

When you run *PTEL*, you are placed directly in terminal mode. Pressing the Esc key calls up a command line from which you can enter single-letter commands; if you don't enter a command after a few seconds, a help screen appears with a list of commands. The help screen is divided into seven separate areas, each with a list of specific commands. For example, the System area lets you exit to DOS, use the DOS shell, get the *PTEL* status, and so on. Beneath that is the File area with commands for seeing a file directory and viewing, deleting, and renaming files. Other areas allow you to dial numbers, execute scripts, and change the terminal mode, bit-per-second rate, parity, and duplex setting.

The phone directory stores a limited number of entries. You must load other phone directory files as needed if you have more numbers. Each phone entry stores the bps rate, parity, line-feeds, file-transfer protocol, and terminal-mode settings. The documentation is very vague on the subject of parity, word length, stop bits, and so on. If you are dealing with a host system that requires 7 data bits, 1 stop bit, and even parity, you'll have to experiment with *PTEL* to find the correct settings because there is no explanation as to what these settings mean.

In addition to standard ASCII transfer, *PTEL* supports a number of popular file-transfer protocols: Xmodem, Xmodem CRC, Batch modem, Batch modem CRC, Kermit, Telink, and Telink CRC. File transfer is handled through menus and should be easy even for novice users. The documentation in this section is helpful and thorough, explaining not only what to do but what responses to expect from the host. I had no trouble using both Xmodem protocols and the Kermit protocol on the local bulletin boards I call.

GOOD SCRIPT LANGUAGE Script processing is an important feature in any communications program. *PTEL* has a good script language, but it is so poorly documented that I had difficulty under-

**FACT FILE**



PTEL, Version 4.0
Phoenix Software
Associates
1416 Providence Hwy.,
#220
Norwood, MA 02062
(800) 344-7200
(617) 769-7020

List Price: \$195
Requires: 128K RAM, one disk drive, DOS 2.0 or later.
In Short: In spite of its script-processing capabilities, *PTEL* sacrifices flexibility for ease of use. Not copy protected.
CIRCLE 640 ON READER SERVICE CARD

■ COMMUNICATIONS

standing how it works. The scripts are described in Chapter 3, but the commands are not explained until Chapter 10. The example in Chapter 3 logs you onto the Phoenix Software technical support line, and the hapless reader must wade through a call to a subroutine (another script file) and a series of commands (output, error err2, and error logd) that make little sense on a first or even a second reading.

In their enthusiasm to introduce this feature, the writers at Phoenix have violated a cardinal rule of documentation—forward referencing a reader ahead seven chapters for a description of the commands and the proper syntax. I was able to get the script files working after a time, but I doubt that novice users with no experience in programming will attempt to tackle scripts until they get some help, preferably from Phoenix.

Despite a poorly written manual with an incomplete index, *PTEL* can be used by most novices with little effort. The command structure and help screen will guide most users along through various tasks. Users who require more functionality, such as macros, programmable keys, and on-the-fly parameter settings, will probably not like this program. Even with its script-processing capabilities, *PTEL* is not a power user's program. —Tom Stanton

Respond

When you're sick, you call the doctor. When you use *Respond*, you call Software Synergy's technical support staff—often. The problem lies not in the program's capacity to perform but in its execution.

Respond is inflexible and "user hostile." Using it will make you want to take the screen apart manually and then put it back together so that it at least looks right. Essentially, the program addresses two groups of users: those who want a program to execute such simple functions as dialing MCI Mail or CompuServe (executed in three keystrokes from the main menu) and those who want to take advantage of *Respond*'s integration of various communications modes (asynchronous and synchronous or local and remote) or delve into complexities such as user-defined menus (accomplished with layers of menus and script language). There is no middle ground.

The Quick Start option listed on the main menu offers easy access to over 20 different predefined parameter files from The Source to Dow Jones. You call up a particular file by scrolling through the list with the Plus and Minus keys, plug in the required information, and punch Ctrl-Home. Once you enter terminal emulation mode, you can choose to dial manually by hitting Shift-F3, or without breaking an established connection you can wade back through the main menu to set parameters, such as continuous dialing on the Profile Maintenance menu. The handy *Quick Start* manual, which comes attached to *Respond*'s documentation, facilitates installation and quickly acquaints you with the Quick Start option.

VAGUE MENUS Unfortunately, the rest of the program is obscured by a vague mesh of poorly connected menus. I first abandoned reason and then intuition and



FACT FILE



Respond
Software Synergy Inc.
466 Main St.
New Rochelle, NY
10801
(914) 663-0400
List Price: \$195
Requires: 256K RAM,
one disk drive, DOS 2.0 or later.

In Short: *Respond*'s overdifficult format overpowers its high-performance capacity. Casual users may find the simple Quick Start option worthwhile. Not copy protected.

CIRCLE 66 ON READER SERVICE CARD

finally ended up using the "punch a button to see if it works" method. A menu-driven program should logically progress from general to specific, but *Respond*'s menus go from vague to more vague, combining poor descriptions with lack of organization. On-line help screens only add to the confusion. XPRSS keys, or key combinations that zip you from one part of the program to another, ease the situation, but the program's resources are not, to say the least, at your fingertips.

Somewhere within *Respond* resides a fairly powerful program. Menus and batch files allow unattended operation and remote file transfer. The script language allows you to customize the program—for example, by designing profiles to access other applications programs. *Respond* supports the 19,200 bit-per-second setting. Background file transfer will appear with Version 4.3 (to be released this fall). With all of these useful features hidden beneath its forbidding surface, the question is not whether *Respond* can perform but whether the program is worth the trouble.

Reading through the documentation's pages of nebulous and chaotic text pushed me to the brink of a severe headache. The saving grace was delivered by Software Synergy's technical support staff, who patiently instructed me through the testing procedures.

You must balance the time required to learn *Respond* against the program's performance capacity. If an easy-to-use program is your preference, look elsewhere. —Gretchen Luchsinger

Respond's Quick Start option offers over 20 different predefined parameter files. The plus and minus keys change the value of the parameters, and pressing Ctrl-Home will start communications.

RESPOND Quick Start

PARAMETERS	VALUES
(0) Service/Terminal/Modem	CompuServe/TTY/Birect Dial
(1) User ID	CTD
(2) Password	CTD
(3) Network Address	(not required)
(4) Telephone Number	CTD
(5) Dialing Method	TIME
(6) Profile	Hayes Compatible 300 or 300-1200
(7) Communications Adapter	COM1
(8) Baud Rate	1200
(9) Character Bits (Not for Service)	7 Bits - Ignore Parity - 1 Stop
(10)	

INSTRUCTIONS

Use the Plus and Minus Keys to Change the Values of This Parameter
Use the Space Bar or Arrow Keys to Move Cursor
Press the Ctrl-Home Key to Return to the Main Menu
Press Ctrl-Home When All Values Are Correct to Start Communication

MESSAGES

Note: Identifies the Service and the Modem You Wish to Connect to It

Microsoft Access

Microsoft Access is so ridiculously easy to get started and use that you may be tempted to entirely ignore its more-advanced features. While *Access* has an extensive script programming language and customizable menus, you certainly don't need to take advantage of them to enjoy this easy-to-use communications program.

On first-time use, *Access* goes through a painless installation procedure and leaves you sitting at the main menu with the cursor on the Connect option. Press Enter, type in a name and a phone number, and *Access* will first ask if you want to store the name and number in the phone book file, and then it will dial. Although you may not notice it at first, that Connect menu also has an option for *Access* to learn the log-on sequence. If you use it, logging on again will be a simple matter of entering *Access* and pressing the Enter key twice to accept the default menu options.

The menu at the bottom of the *Access* screen will be familiar to anyone who has used other Microsoft products such as *Microsoft Word* or *Multipan*. The menu is not normally displayed while you're online, but you can call it up with the F10 key. Some of the key words used in the menu are a little odd (for instance, "Transfer" followed by "Protocol" to do an Xmodem file transfer), but there's very little you have to memorize to use the program.

When you specify that *Access* should learn your log-on procedure, it creates a ASCII file that you can later edit and enhance. This file contains commands from the *Microsoft Access Script Command* (MASC) language, which is a full-fledged programming language that can automate *Access* sessions. MASC is most similar to BASIC in much of the flow control and string handling, but it also includes a useful Case construction for matching incoming text. About 70 manual pages are devoted to MASC.

SCRIPT FILE CALLING One script file can call another. You can have a log-on script that just gets you onto a host and another script that checks mail and downloads if it is necessary. The second script

can call the log-on script and then continue from there. MASC includes enough power to program bulletin boards and enough error detection to bulletproof them.

At the other extreme, you may not want to bother with programming. You may even want to insulate yourself from the many different command structures used by on-line services. *Access* helps out there also. Included with the package are menu files designed for CompuServe, Dow Jones News/Retrieval, the Official Airline Guides, and others. These substitute an *Access*-type menu for the host computer's command interface. A \$25 development kit from Microsoft lets you create your own menus. For corporations and value-added resellers, this customizable menu front end is probably *Access*'s most important feature.

Although much of normal *Access* use is easy enough, the fancy stuff (such as dialing up one or more host computers and downloading files while you're sleeping), requires some MASC programming. You can start off simple by filling in some gaps in *Access*. For instance, *Access* has no "repeat dialing" facility, which is useful for getting on bulletin boards that can handle only a few phone lines. It's easy enough to sit there and hit Enter twice in succession each time you want to call, but you can also write a short script file that loops until you get a connection.

Without using MASC, *Access* is oriented mostly toward using on-line services, and it slips somewhat for other jobs. The

Access manual is big enough (400 pages) and seemingly complete until you start trying something unusual. Sorely needed are some examples of operations other than calling up a host computer over the telephone line. For instance, it's not quite clear what you have to do to get *Access* talking with another computer when the two modems are directly connected. Another strange omission is *Access*'s inability to tack a line feed onto echoed carriage returns. In a "chat" mode with another PC, you're likely to have a problem with missing line feeds on the stuff you type.

These problems are certainly annoying, but they are minor compared with what *Access* offers to both beginners and experts. I am most impressed by how *Access* manages the difficult juggling act between ease of use and power. —Charles Petzold

Relay Gold

VM Personal Computing has put together an impressive array of communications products that may be ideal for corporations that make a commitment to *Relay Gold*. *Relay Gold* is a versatile and powerful communications program (with such things as a comprehensive script language, a resident mode, and background file transfers) that can also let a PC emulate a 3270 terminal over the phone line, engage in "error-free" VM/CMS and TSO file transfers, and control IRMA, IBM, or Forte 3278 emulation boards.

Corporate commitment to *Relay Gold* may be necessary because *Relay Gold* reveals its full potential only when communicating with other PCs that also have *Relay Gold*. Using *Relay Gold* to communicate with your mainframe over telephone lines requires VM Personal Computing's *Relay3270*, *Relay/VM*, and *Relay/TSO* software to be installed on the mainframe.

Relay Gold's script language is very extensive and even extends to controlling the built-in text editor. Thus, you can write a script that calls a mainframe, downloads a file, modifies it somewhat with the text editor, and then calls a PC and transfers it there. For file transfers, *Relay Gold* supports Xmodem (in both the checksum and CRC versions), Kermit, and a proprietary transfer with another PC using *Relay Gold*.

**FACT FILE**

Microsoft Access,
Version 1.01
Microsoft Corp.
16011 NE 36th Way
Box 97017
Redmond, WA 98073
(206) 882-8080
List Price: \$200
Requires: 256K RAM, two disk drives (hard disk recommended), DOS 2.0 or later.
In Short: *Access*'s ease of use will please beginners, and its script programming language and customizable menus will please power users. Not copy protected.

CIRCLE 679 ON READER SERVICE CARD

Tech Personal Computer's

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System supports up to six printers.

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■ COMMUNICATIONS

You can get started with the program's script language by having *Relay Gold* learn your log-on sequence. If you have the same experience that I did—*Relay Gold* failed to correctly learn my Dow Jones log-on the three times I tried it—you can go into the built-in text editor and fix it so that it will work.

GENERIC PARAMETERS *Relay Gold* comes with a phone directory already set up with parameters for a variety of generic computers you can communicate with using *Relay Gold*. You create a specific entry by copying the parameters for the generic entry, typing in a name and phone number, and modifying parameters if you want. This method has some "gotchas," though. The first time I used it to set up parameters for calling the PC Magazine Interactive Reader Service, I neglected to specify in these parameters that I wanted Xmodem file transfers. When I got to the point where the IRS was expecting me to initiate Xmodem on my side, I found out I couldn't do it because the parameters were not set up for Xmodem and I couldn't change them while on-line. If you specify a non-ASCII file transfer in the parameters, you can still use an ASCII transfer but not the other way around.

You can either run another program on top of *Relay Gold* while on-line or make *Relay Gold* resident in memory. In the latter case, a file transfer will proceed in the background, though it will be suspended at times to avoid DOS nonreentry problems

(for instance, while your cursor is sitting at the DOS prompt).

In resident mode you toggle back to the *Relay Gold* screen using the Alt-Ctrl-Left-Shift combination. I had some problems with this toggle, including a crash after *Relay Gold* asked me to change a disk but didn't seem to recognize that I had done so. As a resident program, *Relay Gold* has certain responsibilities to not interfere with other programs, and it does not entirely meet these responsibilities. If you toggle back to *Relay Gold* while running a program in any graphics mode, you'll get the message "Warning: Unable to save program's display," and when you toggle back to the program the screen will be blank. Although *Relay Gold* can recognize EGA graphics displays (but still not save them), it cannot recognize the EGA 43-column mode. When you toggle back to a program using 43-column mode, the display will be in the 25-line mode (although the program won't know that).

In resident mode, a specially written program can communicate through *Relay Gold* via an applications program interface by passing script commands or keystrokes down to it. When connected to another *Relay Gold* machine, two programs can communicate with each other through *Relay Gold*.

Although the *Relay Gold* package has a lot on the inside, I found some failings in both the command structure and the manual that I saw. Some of the features seemed tacked into the program and do not appear in a menu (for instance, the fact that Alt-L learns a log-on sequence). Contrary to the only industry standard that has emerged for function-key definitions, context-sensitive help (which is very good, by the way) uses the F10 key rather than F1. While you're on-line you can bring up the *Relay Gold* menu by pressing Esc. If you actually have to send the escape code to an on-line service or bulletin board, that's the F2 key.

The manual I saw has about 350 pages, but the table of contents and index were not very helpful in finding things. As of this writing, the new *Relay Gold* manual was not yet available but I was told it was much better. A new *Getting Started* manual is very good, so I suspect the new manual will be also. —Charles Petzold

Miracle

Two years ago, when integrated packages were a trendy new item, debate raged as to whether database- or spreadsheet-based systems were best. In *Miracle*, Micro-Systems Software has created a third alternative that may be the best idea of all: a communications-based integrated package.

Miracle combines communications software with a text editor (and a built-in print formatter), spreadsheet, graphics,

PC EDITOR'S CHOICE

If you're looking to establish a corporate-wide standard for communications, look at *Relay Gold*. In addition to offering support for micro-to-mainframe communications, *Relay Gold* includes some valuable tricks—like being able to transfer files in the background while you run another applications program.

If the majority of your communications link you with on-line services, then Microsoft Access is a clear choice. The prewritten script files and auto-learn feature make automating communications an almost trivial task. However, the program is not as useful for other jobs.

Ascom IV offers neither the extreme ease of use of Microsoft Access nor the specialized features of *Relay Gold*, but it has far more features than most users are ever likely to need. What's more, its script language will let you create any features it lacks.

Honorable mention goes to Hyper Access. Although it suffers from the lack of an on-line help feature, the program offers a better than average mix of power and ease of use. Easy and fast, PC-Talk III has a special status as the program that established a standard for others to beat. And if you're interested only in communications from the keyboard, PC-Talk III will do just about everything you'll ever need.



FACT FILE



Relay Gold, Version 2.0
VM Personal Computing
41 Kenosia Ave.
Danbury, CT 06810
(203) 798-3800
List Price: \$250
Requires: 128K RAM
available memory, one
disk drive, DOS 1.1 or later.

In Short: *Relay Gold* is an extremely powerful package that includes a script language, an applications program interface, background file transfers, and mainframe communications. Not copy protected.

CIRCLE 846 ON READER SERVICE CARD

time-oriented batch processor, and several DOS functions in one cohesive package. Standalone programs cannot be substituted for these internal functions.

Most of *Miracle's* user controls rely on a 1-2-3-like interface: a bar-line menu appears (albeit at the bottom of the screen) and permits you to choose functions either with the appropriate letter key (the command names, incidentally, are listed in precise alphabetical order) or by stepping to the appropriate command with the Spacebar. In the word processor, Alt- and function-key combinations elicit most commands, such as block marking and moving. Dangerous commands, like Exit, require a second step to confirm.

The manual, though seemingly brief for the amount of material it must cover, clearly explains basic functions and includes a reasonable reference for most program commands. Context-sensitive, on-line help is constantly available.

MODEST POWER *Miracle's* modules are actually modest in power. The word processor, for instance, digests ASCII text and displays the minimum functionality you'd expect from a word processor. On the other hand, the modules are powerful enough to be useful. You can use them to write business letters, analyze a budget, and call any computer that can deal with ASCII text using the Xmodem (or Xmodem CRC) protocol.

Although most of *Miracle's* power seems to have been lavished on its communications function, it doesn't rival the latest communications-only programs. Its definable parameters have limited range.

Miracle's help feature is structured like a book or manual for easy reference. You can glance at the brief "table of contents" or study the more in-depth and alphabetical index.

■ *Miracle* can easily be programmed to handle complex data-gathering and analysis functions.

Communications rates, for instance, include only 300, 600, 1,200, 2,400, and 9,600 bits per second. The program emulates only DEC terminals, Model VT52, VT100, and VT102. It won't operate under the control of a remote computer and cannot build a bulletin board. Nor can you exit to DOS and return to *Miracle* with communications in progress. Built-in support is included only for the original Hayes command set. However, nearly all modem commands can be redefined, and so you can set up *Miracle* to work with any modem (if you know or can figure out the proper command set).

The functions that are included, however, are probably the most popular and useful, and so in typical applications the omissions won't matter. *Miracle* handles all the basic communications functions (for instance, capturing and sending files) with aplomb. Its learn mode and macros (up to ten macros of 63 characters each per telephone number) make it simple to automate routine chores. *Miracle* even excels in its filtering and formatting abilities and can convert characters not only when they are incoming and outgoing but at almost

any stage in the communications process.

With *Miracle's* modest but competent DOS support, you might never have to exit the program during your daily work. You can even run two modems on different communications powers simultaneously to handle two different communications sessions in separate on-screen windows. *Miracle's* greatest strength shows up during unattended operation. An extensive language allows not only unattended communications operation but also the cooperative working of *Miracle's* other functions. The language is brought to life through "agenda" files—*Miracle's* internal, enhanced version of batch processing.

The strength of the communications center becomes apparent when you run an agenda. *Miracle* can easily be programmed to handle complex data-gathering and analysis functions. You can create an agenda file which, at an appointed time (typically after midnight when rates are cheapest), will dial up your favorite database, download specific information, reformat it, slide it into a spreadsheet for analysis, and then automatically graph the results. If you track stocks, *Miracle* could dial up Dow Jones News/Retrieval and give you the graphic picture of the condition of your portfolio every day.

While *Miracle* is not in the same league as *Symphony* and its competitors when it comes to raw spreadsheet power and isn't as heavy hitting as the latest generation of word processors, such as *WordPerfect* or

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HELP



FACT FILE



Miracle
 Micro-Systems Software
 4301-18 Oak Cir.
 Boca Raton, FL 33431
 (707) 394-5633
 List Price: \$299.95
 Requires: 256K RAM,
 two disk drives, DOS 2.0

or later.

In Short: A communications-based integrated software package that includes terminal emulation, word processing, spreadsheet, and time-oriented batch processing. It is powerful enough for everyday use. No copy protected.

CIRCLE #71 ON READER SERVICE CARD

■ COMMUNICATIONS

Microsoft Word, *Miracle* still beats them all in a sense: it's easy enough for the most inexperienced user to master in a few minutes. *Miracle* may be the best integrated combination of all for people who need to process a lot of information from remote databases and don't want to tangle with more power than they need.

—Winn L. Rosch

Enable

To many people, telecommunications is of little use unless it's integrated with other functions. If you number among them, you might do well to consider *Enable*. The integrated program of choice in *PC Magazine's* last survey (see "Integration with Integrity; Framework, Symphony, and *Enable*," *PC Magazine*, Volume 5 Number 11), *Enable* offers a flexible communications module with function-key menu selection of as many stored numbers or services as most users would ever desire. While *Enable's* telecommunications component is fairly powerful and easy to use, its best feature is that it's a part of *Enable* itself, with accompanying word processing, spreadsheet, database management, and graphics components.

Enable has two ways to call other computers. Using the more primitive form, the Quick-Connect feature, you select communications parameters and type a telephone number directly on the keyboard. Quick-Connect is fine for one-time calls or when you absolutely must keep an *Enable* document, sheet, or file in memory while calling a computer whose phone number hasn't previously been stored in the setup menu.

The more elegant way of using *Enable's* telecommunications, however, is through the Telecommunications Setup feature. Documentation for Version 1.1A of *Enable* claims you can store up to 64 setups. But, in practice, the programmers at The Software Group say the real capacity is closer to 200 setups.

A given setup file includes more than just telephone numbers, user names, passwords, log-on sequences, and communications parameters. You can also store such helpful information as an alternate setup to try if the given number is busy or doesn't answer, connect-time cost (*Enable*

will continuously track and display charges while on-line), and time-delay options for outgoing and incoming characters and lines.

Once a setup has been stored, selecting and setting parameters, dialing, and logging on to another computer or an on-line service is very simple. Using the *Enable* function menus, you simply choose Telecommunications, Communicate, and Setup. When the table of setups appears, you either type in the name of the desired setup or move the cursor around the table, point to the setup you want, and hit the Enter key. At that point you just sit back and let *Enable* do the rest of the work.

One of the nicest features of *Enable's* integration with other applications modules is the close coexistence of telecommunications with word processing. Whenever you go on-line, you are prompted for a word processing filename in which to save incoming data. You do not have to save the data to disk unless you want to, but while you are on-line you can move through the previously received information with full word-processing control. You can edit data while *Enable* works in the background, continuing to receive information from the remote computer. The amount of incoming information that will be stored in memory depends on how much memory is available.

An attractive alternative to keeping everything in memory is to do a direct disk save that will automatically save every-

thing coming in on a designated disk file. Later on you can decide whether to keep the file and, if so, use *Enable's* word processing ability to clean it up.

Installing the *Enable* program itself requires the system documentation. Once *Enable* is installed, you can use the communications module without reference to the separate telecommunications manual. Needed information is displayed on the screen or is available from context-sensitive help screens.

The current version of *Enable* does not allow a communications host mode or unattended operation (it doesn't now have a script language either, a necessary feature for unattended operation).

FUTURE IMPROVEMENTS A significant factor to consider is future versions of *Enable*. I visited The Software Group in Albany to see a working version of *Enable* 2.0, due in mid-September, and to see a custom multitasking version currently used by the U.S. Air Force.

The biggest changes in telecommunications in Version 2.0 are a full script language and the ability to work in unattended mode. Version 2.0 still will not work unattended as a host computer, which I would like, but the improved programming ability will greatly increase the program's flexibility. According to The Software Group, multitasking and network support will both be available as add-ons sometime during the fourth quarter of 1986.

You probably wouldn't buy *Enable* just for its telecommunications power, although you may like the user interface enough to do just that. However, if you need an integrated package that includes powerful and flexible communications ability, ease of use, and access to other modules, *Enable* is a good choice.

—Bruce Brown

Framework II

What do you get when you cross a full-featured telecommunications program with a well-integrated word processor, spreadsheet, and database management system? You get a program that lets you perform most communications tasks with ease—in short, you get *Framework II*.

Don't try to install *Framework* without

**FACT FILE**



Enable
The Software Group
Northway Ten Executive
Park
Ballston Lake, NY
12019
(800) 551-1004
(800) 634-3470 (in New
York)

List Price: \$695
Requires: 256K RAM, two disk drives,
DOS 2.0 or later.

In Short: A well-regarded integrated program with a powerful and flexible telecommunications module. Not copy protected.

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Manufacturer's minimum limited warranty period is listed after each company name. Some products in their line may have longer warranty periods.

AST Research ... 1 to 2 years

• SixPakPlus 64k C/SIP includes Sidekick vers. 1.5 not copy-protected & DESQView	\$159.
• SixPakPlus 384k (fully populated)	209.
• SixPakPremium 512k C/SIP upgrades to 1 Meg, fully compatible with LOTUS/INTEL expanded memory specification (EMS), includes DESQView	369.
• AST-5251-11	579.
• Advantage 128k upgradeable to 1.5 Meg includes Sidekick version 1.5 not copy-protected and DESQView	369.
• RAMpage! 256k upgrades to 2Mb	call
• RAMpage! AT 512k upgrades to 2Mb	call
Both RAMpage boards support EMS and fully support EMS, and include DESQView	
Amdak ... 2 years	
• Video 310A mono monitor (amber)	159.
• Color 722 - EGA compatible	519.

Compucable ... lifetime

• Plastic Keyboard & Drive Cover Set	15.
• IBM Mono Screen Enhancement	17.
Cuesta ... 1 year	
• Uninterruptible power backup units	call
• Datasaver 400 Watt	call
Curlic ... lifetime	
ACCESSORIES	
• Low Profile Tilt and Swivel Pedestal	25.
• PC Pedestal (for IBM Mono or Color)	27.
• Portable Pedestal (for portable computers)	36.
• Printer Stand	18.
• System Stand (for IBM PC & XT)	19.
• Universal System Stand	25.
• Crystal 300 Watt (line conditioner)	159.
CABLES	
• Smartmodem to IBM Cable	17.
• Keyboard Extension Cable (3 to 9 feet)	27.
• Extension Cables for IBM Mono Display	33.
• Color and Monochrome Extension cables	39.
• Printer to IBM cable	17.

SURGE SUPPRESSORS

• Selestro p (6 outlets)	21.
• Diamond (6 outlets)	29.
• Emerald (6 outlets, 6 ft cord)	36.
• Sapphire (3 outlets, EMVRFI filtered)	47.
• Ruby (6 outlets, EMVRFI filtered, 6 ft cord)	55.
• Command Center	SPECIAL
DCA ... 1 year	
• Ima (3270 emulator)	729.
Epson ... 1 year	
• FX-800 (80 column, 300 cps)	call
• FX-85 printer (80 column)	call
• FX-286 printer (136 column)	call
• LX-68 printer (80 column)	call
• LX-1000 printer (136 column)	call
• LQ-2500 (136 column, 324 cps)	call
• Printer to IBM cable	15.

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800/243-8088

Everex ... 1 year

Evercom II internal modem w/software ... special

Hayes ... 2 years

* Smartmodem 1200 ...	389
* Smartmodem 1200B (w/Smartcom II) ...	349
* Smartmodem 1200B (no software) ...	319
* Smartmodem 2400 ...	589
* Smartmodem 2400B (w/Smartcom II) ...	529
* Smartcom II 2.1 (software) ...	89

Hercules ... 2 years

All Hercules boards come with parallel port and FREE parallel printer cable

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Hercules Graphics Card ...	189
Hercules Graphics Card Plus ...	189

Intel ... boards: 5 years; chips: 1 year

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Above Board AT 128k (upgrades to 2 Meg) ...	call
Above Board PS 64k C/S/P (upgrades to 1.5 Meg) ...	call

Above Board PS AT S/P (upgrades to 1.5 Meg or higher w/piggyback) ...	call
8087 (for IBM-PC & XT) ...	129

8087-2 (for 8 MHz computers) ...	177
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80287 (for 6 or 8 MHz IBM-PC AT) ...	225
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80287-8 (for 10 MHz & faster IBM-PC AT) ...	269
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Kensington Microware ... 1 year

* Masterpiece ...	94
* Masterpiece Plus ...	129

* Printer/portable computer stand ...	17
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key tronic ... 90 days

5150 keyboard ...	115
5151 keyboard (deluxe) ...	169

Kraft ... 1 year

New! 3 Button Joystick ...	35
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Microsoft ... 1 year

Mach 10 (accelerator board) ...	369
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Mouse Systems ... lifetime

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NEC ... 2 years

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NSI Logic ... 3 years

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Orchid Technologies ... 1 to 2 years

Conquest Multifunction Board 0k; upgrades to 2Mb, fully supports EMS spec. ...	264
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Eccell Multifunction Board for the AT ...	399
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Tiny Turbo 286 ...	445
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PC Turbo 286 w/1 Meg ...	739
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Turbo EGA ...	589
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EGA ...	289
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Princeton Graphics ... 1 year

MAX-12E Amber monochrome monitor ...	179
HX-12 RGB monitor (690 x 240) ...	449

HX-12E (EGA compatible) ...	539
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Quadram ... 1 to 2 years

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* Microfazer Printer buffer 64k (parallel) ...	159
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* Microfazer II Printer buffer 64k (expandable to 512k, selectable input/output modes) ...	399
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* QuadEGA+ (half-card) ...	349
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All Toshiba printers listed are 24 pin dot matrix.

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* P351 serial/parallel printer (136 col.) ...	1089
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Toshiba T1100 PLUS Laptop Computer ...	call
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Toshiba T3100 Laptop Computer ...	call
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Teeng Labs ... 1 year

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VEGA 7 ... 2 years

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I2 interface ... 1 year

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IOMEGA ... 90 days

* Bernoulli Box 20 Meg w/PC2 card ...	1849
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PC2B (Bootable) Card ...	229
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20 Meg cartridge ...	67
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Bernoulli Box Car Kit ...	79
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Mountain Computer ... 1 year

Drive Card 20 Meg (80 ms) ...	call
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Drive Card 30 Meg (78 ms) ...	call
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Seagate ... 1 year

20 Meg Internal Hard Drive (w/controller and cables, 65 ms) ...	389
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* 20 Meg Internal Hard Drive for the AT (40 ms) ...	569
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TEAC ... 1 year

FD-55BV Drive (5 1/4" half-height) ...	109
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Toshiba ... 1 year

PC, XT 360K Drive (5 1/4" half-height) ...	109
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* AT 360K Drive (5 1/4" half-height) ...	117
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* Kalmor Teakwood Disk Holder (holds 100) ...	29
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* Floppione Disk Drive Cleaner (5 1/4") ...	18
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* Innovative Concepts Flip n' File 50 ...	16
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■ COMMUNICATIONS

the documentation, but once it's running, the telecommunications module is just a few intuitive keystrokes away. You set the configuration options in a series of "fill-in-the-blank" windows, and you can then be on-line in a jiffy. It helps to be somewhat familiar with the way *Framework*'s menus and frames work.

Under the *Framework* telecommunications application beats the heart of the old standby, *MITE*. This news should not surprise those who have followed the integrated software market. When *Symphony* first hit the market with a communications module, Ashton-Tate responded quickly by tacking *MITE* onto the original *Framework* package.

Framework II has some refinements over the original version, and the communications features have been more carefully integrated with the other modules. The pull-down menus now cover all the features. *MITE*'s influence is still clear, however, and the documentation points out that you can even load parameter files (*.PAR) from *MITE* (Versions 2.7, 2.8, or 3.0) into *Framework* and they will work. *Framework* cannot write .PAR files for *MITE*, however.

When you ask for a telecommunications session, you may either use the current frame or request that a new frame be opened. Within the limits and confines of the *Framework* environment, you can operate other functions concurrently. You may leave your communications session frame to call up and edit a file or to send a job to the printer. You can even open a DOS window and execute DOS commands. However, you cannot leave *Framework* entirely and maintain the session, but anything else within the program will work. This feature worked flawlessly with both *ProKey* and *SideKick* loaded in memory, but *ProKey* did create a related problem; it prevented *Framework* from recognizing a ScrollLock keystroke, which effectively disables the entire program. (According to an Ashton-Tate representative, there is now a *ProKey* revision that works properly.)

BACKWARD SCROLLING One nice feature of *Framework* is that you can scroll backward through the session, even while it is running. The program will continue to

accept data from the modem, while you go back and review what has already gone past. You can save this as a file and edit it just as you would any other document. If you prefer, you can download text directly to a file, using the options available in the Text Transfer menu.

If you want to upload a file, you can select a frame by highlighting it, then open the Text Transfer menu and select Send as Text. You can also copy a portion of text from a frame (word processing, spreadsheet, or database) and use the function keys to copy it into the telecommunications session frame. Uploads can be governed by character echo, Return/Line Feed handshake, or a "turnaround" character (such as those produced by some mainframe systems to indicate that they are ready to receive the next line).

For binary files, you have just about every option that you could want. In addition to plain Xmodem, you have Batch Xmodem, Clink and Crosstalk, and Smartcom protocols to choose from. You can also specify the CRC option for either Xmodem protocol.

Framework II has ten user-programmable macro keys assigned to function keys, just as *MITE* does, and the tenth macro serves double duty as the auto-log-on macro. The macro language is similar to *MITE*'s, but you can also call upon the power of the FRED programming language to create complex custom functions. You can combine a series of codes in a single macro to handle complex sequences,

and can even er macro, including a system macro. As a complete applicat.

You can also se mote access. You m to limit access to you, leave it unattended. W dial in, they must supply gain access. Once in, they machine by sending a trigger (Ctrl-R, by default), and then sue a variety of commands. Th turning the file capture feature on reading directories, setting up p transfers, and other commands co the sending and receiving of files. Th same commands are also available dur any telecommunications session as loca commands, triggered by Ctrl-Ins.


The communications section of *Framework* is not wonderful enough to warrant buying the entire program for its sake alone, but it is not the weak link in the package either. If you are considering a program that makes it easy to integrate communications with word processing (and to a lesser degree with spreadsheets and databases), *Framework* is worthy of a long look. —Alfred Poor


Symphony

If you divide your time between analyzing spreadsheets and telecommunicating them to others, you might consider *Symphony*. Version 1.1, an integrated program well suited to quick changes between the two activities. The catch to this jack-of-all-trades program is that it lacks the flexibility you'll find in a good standalone telecommunications program.

While *Symphony* is accompanied by copious documentation, it strangely omits vital information on the proper settings for use with a Hayes modem (Lotus Development Corp.'s helpful customer support supplied them). Loading from a floppy disk is slow (with a hard disk you must still use a key disk in drive A:), but once the program is in memory things move briskly along.

Along with its 1-2-3-like menus, you use parameter files and the *Symphony* Command Language (SCL), a derivative of 1-2-3's macros, to control *Symphony*

**FACT FILE**

**Framework II,
Version 1.0**
Ashton-Tate
20101 Hamilton Ave.
Torrance, CA 90502-
1319
(213) 329-8000
List Price: \$695

Requires: 384K RAM, two disk drives,
DOS 2.0 or later.
In Short: *Framework* integrates communications with its other features, giving you easy access to a wide range of features. Copy protected.

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CIRCLE 235 ON READER SERVICE CARD

■ COMMUNICATIONS

communications. *Symphony* supports the Xmodem protocol for file transfers, which is just what you need to transmit spreadsheet files to other *Symphony* or 1-2-3 users. For on-the-fly communications, *Symphony* allows you to mark off a portion of the spreadsheet you're currently working on and send it as text. In accomplishing this, you sacrifice all underlying formulas, but if the receiver doesn't require them, he need only set his *Symphony* spreadsheet's column widths to match yours, and the program will then enter that data into the appropriate cells without any explicit parsing. When you're in too much of a hurry for such forward thinking, a menu choice allows you to parse after the fact.

Least it sound like the perfect solution to a spreadsheet user's telecommunications needs, you should be aware that this marriage may bring out the worst in each partner. Just as telecommunications users must suffer while waiting for file transfers to finish, spreadsheet users are hobbled by recalculation delays. Since *Symphony* lacks concurrency, you'll be unable to escape the inevitable and sometimes annoying waiting periods in one mode by switching to the other.

While *Symphony* makes it easy to send portions of your spreadsheet as text, in most ways it is less flexible than standalone telecommunications programs. You must perform all file transfers under Xmodem protocol. If you are communicating with someone whose program doesn't support Xmodem and all you want to do is send a text file, you'll have to load that file onto your worksheet and then send it in a separate step. On the receiving end, *Symphony* requires that you capture text files onto the worksheet and then save them to disk.

In order to separate captured data from existing spreadsheet data on the worksheet, *Symphony* requires that you designate an area of the worksheet on which to store the incoming data. When, in the course of an on-line session, the capture area filled (and who can predict the length of an on-line session?), I always lost at least some of the data I'd hoped to capture. *Symphony* also imposes a maximum of 240 characters per line for incoming data. If incoming lines are longer, you lose the excess.

ENCRYPTION Menu choices allow you to establish communications settings, including a stored phone number and log-on sequence. The program lets you encrypt a worksheet file to prevent others from retrieving it and obtaining a stored password, but you can't encrypt parameter files. And if you want to store more than one log-on sequence, you'll have to place each of them in its own parameter file, where the log-on information is available to anyone using the program. When you're ready to graduate to unattended operation, you'll need to turn to SCL. SCL contains most of the features associated with a fourth-generation programming language as well as a learn mode, but if all you want to do is automate telecommunications sessions, you may find the batch facilities of single-purpose communications programs easier to handle. SCL represents menu choices with single letters (compared with *Crosstalk*'s full-word syntax) and requires you to program your way around each contingency that may occur in the unpredictable world of telecommunications.

For example, the SCL verb {handshake} enables you to send a string and wait a specified amount of time for one in return. However, if you want to resend the string or specify multiple retries, you'll first have to write a counter-controlled loop. Since *Symphony* lacks any automated redialing function (and cannot use the Hayes extended command set to detect a busy signal), don't expect to use SCL if you hope to get into popular bulletin board

systems such as the (frequently busy) PC Magazine Interactive Reader Service (PC-IRS).

Symphony simplifies the transfer of spreadsheet files or data residing on its worksheet but is less versatile than many standalone telecommunications programs. While its programming language is tricky to use, it can let you automate both the acquisition and analysis of data; however, when used interactively, *Symphony*'s lack of concurrency dampens the synergy that might otherwise result from that potent combination.—Richard W. Ridington, Jr.

Smart Software System

If you like communications served as just one of several courses on your PC's menu, Innovative Software's *Smart Software System*, Version 3.01, may be just the meal plan for you. Available in tandem with the entire system—spreadsheet, database, and word processing—or in combination with any one of the system's components, this program's communications component has a command structure and programming language highly consistent with those of its other modules. Although it offers a dizzying five opening menus, all of the most-common functions—dial/answer/hangup, transmit/receive, capture, and settings—are accessible from just one command list. A collection of "quick keys" makes short work of frequently used commands.

Once on-line, you can capture the contents of your session into the communications buffer or a disk file, or you can print it. Capturing to a buffer eliminates disk delays (especially if you're working with a floppy), but while you can review the contents of the buffer, you'll need to save it as an ASCII file before you can edit it with *Smart*'s own line editor. An exception to the otherwise smooth flow of operations occurs when you switch between the originate and answer modes: it triggers a 20-second delay while the program reinitializes the modem.

Smart uses a proprietary file-translation scheme to move data between each of its modules. If you are telecommunicating data created in a *Smart* spreadsheet to be used in a *Smart* database, a menu choice allows you to place it in the format needed

**FACT FILE**

**Symphony**

Symphony, Version 1.1
Lotus Development Corp.
55 Cambridge Pkwy.
Cambridge, MA 02142
(617) 253-9150
List Price: \$695
Requires: 384K RAM,
one disk drive, DOS 2.0 or later.

In Short: *Symphony* makes simple work of telecommunicating worksheet-based data and spreadsheet files, but it's less versatile than many standalone communications programs. Copy protected.

CIRCLE 69 ON READER SERVICE CARD

by the recipient. If you are receiving data as fixed-length records from a stock-quotation service, you'll need to parse it by specifying each offset where fields begin and end. While the *Smart* command for doing this parsing is more difficult to use than similar commands in *Framework II* or *Symphony*, it is also more flexible; it enables you to divide one record into several or combine several records into one. Conversely, one place *Smart* is less flexible than the other programs is when addressing the modem directly: you must first reconfigure *Smart* by telling it you're using a "null modem" (direct connect).

In place of comprehensive terminal emulation (*Smart* emulates only TTY and ANSI terminals), a keyboard-redefinition command allows you to attach single or multiple characters to a key. Given both the character translation tables and the patience, you should be able to use this facility to configure *Smart* to emulate the terminal of your choice. *Smart*'s normal keyboard macros are inoperative in terminal mode—which is inconvenient if you've grown fond of them in other areas of the program. Although not as convenient as macros, you can use the keyboard redefinition command as a substitute.

PROGRAMMING LANGUAGE What you can't do through the services of its menus, macros, quick keys, and savable keyboard redefinition profiles, you can ac-

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PC FACT FILE



Smart Software System, Version 3.01

Innovative Software Inc.
9300 W. 110th St.
Overland Park, KS
66215
(913) 492-3800

List Price: \$895 (single-user version, includes all modules)

Requires: 256K RAM (Spelling checker in word processor requires an additional 64K; certain printers require additional memory), two disk drives, DOS 2.0 or later.

In Short: One of the strongest entries in the integrated program field also has a strong, though not exceptional, communications module. Not copy protected.

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■ COMMUNICATIONS

comply using *Smart's* programming language. As in many other programs possessing proprietary languages, *Smart's* designers took some liberties at your expense. For example, the program's menus lack an auto-log-on command, forcing you to rely on its programming language to meet that most common of communications requirements.

The language's English-like syntax is easy enough to master; nonetheless, using a program to control the vagaries of a telecommunications session takes some doing. Knowing when to force a carriage return or prevent a line-feed will likely send you fleeing to *Smart's* support hotline more than once, but the language has the tools to handle the task if you have the perseverance to learn it. My only complaint concerns its inability to set a comprehensive error trap. Instead, your program must test for errors wherever it may be exposed to them.

Smart has auto-dial (with multiple retries) and auto-answer features. Once you are connected to another terminal, if you type Ctrl-C, *Smart* places the answering terminal in remote mode; if you have the proper authorizations, you can then list disk directories and transmit or receive files (the program supports plaintext file transfers and Xmodem protocol). However, that's the limit; you can operate neither other programs nor other parts of the *Smart Software System* while in remote mode. In certain instances, you can drop to the operating system and work from the DOS prompt without losing a carrier, but you cannot access other *Smart* modules (when I tried, the program crashed). I encountered a small problem with disconnecting; when noise on the line hung the program and I turned off the modem to disconnect, *Smart* continued to believe it had a carrier.

You must write a program to create an auto-log-on sequence, and you won't find concurrency or a wide selection of terminal emulations, but its menu-driven structure, parameter files, keyboard redefinition options, and programming language combine with support for Xmodem protocol, auto-dial/auto-answer capabilities, limited remote mode, and easy integration with other *Smart* modules to meet most communications needs with ease.

—Richard W. Ridington, Jr.

The Only EGA



A fully compatible 256k EGA card with a parallel port for only \$259. If you buy any display card: Color, Monochrome, Hercules, or EGA, without reading this ad, you're probably throwing away a lot of money.

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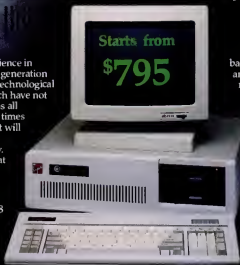
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The Cheapest ATs Ever



hen IBM first introduced the PC AT, it clearly upped the ante for personal computers. This fast new machine had more features, ate up more desk space, and cost more money. After about a year, the first AT-compatible alternatives appeared, manufactured by companies like Compaq, AT&T, and Hewlett-Packard. But these machines didn't do much to soften the blow to your pocketbook. The first really low-cost AT alternatives began to appear just about 6 months ago, from a somewhat unexpected source: the mail-order houses that have been marketing name-brand hardware and software at discount prices for years.

Largely through the magic of offshore manufacturing, these companies are able to offer fully AT-compatible machines at

Two years after the IBM PC AT's birth, the market is flooded with inexpensive compatible computers so like the IBM original that they truly deserve to be called clones. Are these mail-order models worthy of your consideration?

■ THE CHEAPEST ATs EVER

prices that almost seem too good to be true. PC Magazine Labs tested eight low-cost AT alternatives (many more will be reviewed in an upcoming issue) to see how they fared under scrutiny and how they compare to their higher-priced brethren.

IDENTITY CRISIS The eight computers we tested had essentially the same basic configurations: a dual-speed 80286 processor, between 512K bytes and 1 megabyte of RAM, a keyboard and power supply, a high-capacity floppy disk drive, and a 20- or 30-megabyte hard disk. Most are available with or without the hard disk and certain other frills. Prices, of course, depend on the configuration you choose, and so the range is wide: you can get an AT without a monitor or hard disk for as little as \$995 or a fairly complete configuration for about \$2,500.

Despite their varying configurations, the machines are so similar as a group that their most distinguishing feature is an almost total lack of personality. Many share identical keyboards, disk controllers, and other components, and their external appearance is often so close to the IBM model that even the most die-hard AT fan would be hard pressed to tell the machines apart if the logos were masked.

Any engineering and design effort on the part of the manufacturers appears to have been channeled into assuring compatibility. This strategy worked: for a remarkably low price you can obtain a functional AT work-alike.

It is worth noting what you *don't* get with these machines as well as what you do. You don't get the backing of a major player in the computer world, you don't get much in the way of documentation, and you don't get the security of dealing with a company that is certain to exist in 3 years. If these features are as important to you as software compatibility, look elsewhere.

HOW MUCH VALUE? While all of these AT compatibles represent a real bargain compared to the IBM price, \$1,500 or so is still a significant amount of money—especially if you are sending it through the mail to someone you have never met. Before you mail the check, find out what your options are in terms of replace-

ment, exchange, and refund in the event that you are not happy with the machine. Also, make sure that you can find someone locally to service it. Any good PC service center should be able to work with your mail-order AT, but you should ensure ahead of time that this won't be a problem.

Although these eight machines performed as advertised and the companies were helpful with information, remember that you won't be able to take the machine down to your local retail store for advice and help on setup and installation. If you don't think you can set up your AT and install the necessary add-ons and software on your own—or you just don't want to bother—then find someone who can do it for you or choose an AT from a local source.

How good are these low-cost AT's? As a group, their performance isn't spectacular, but they did perform on a par with bare-bones AT specifications. A more adventuresome user could increase performance without compromising price savings much. Most of the units tested are sold with low-performance (read: slow) hard disks. If you buy the basic system without a hard drive, you can install a high-performance hard disk yourself. This gambit will save you some money and increase performance. You should also consider buying a good-quality monitor and video card to add to the basic unit, rather than choosing the more comprehensive and expensive model and accepting the monitor that the company chooses to include. These small changes will make a big difference in your satisfaction level.

While these eight AT alternatives didn't generate high enthusiasm in the Labs, excitement and thrills probably aren't your goals in choosing a computer. An AT is better than no AT, especially if you are on a tight budget. You won't get the performance of a fully configured Compaq 286, but you won't be paying for it either.

—Jon Pepper

A MT AT 286

The AMT AT 286 arrived at the PC Magazine Labs in a somewhat strange configuration, with two quad-density floppy disks (manufactured by Western Digital) alongside its 20-megabyte hard disk drive. Two quad drives instead of at least one 360K

floppy makes little sense, but it's par for the course with the AMT AT 286. Although this machine looks and acts like an AT, enough things are a bit off to build a case against buying it.

Standard features include 640K RAM, the excellent Maxi-Switch keyboard, one serial and one parallel port, and eight expansion slots (only five are available for use). On the down side, the machine is poorly documented, comes without DOS, and lacks a hardware reset switch.

The AMT has only one processing speed (8 MHz), and so you have to take your chances when running programs requiring a 6-MHz clock. The machine behaved rather sluggishly on the PC Labs benchmark tests, turning in one of the slowest speeds on the prime-number-generation test among the 8-MHz machines.

A few relatively minor changes would improve the attractiveness of the AMT: a dual-speed CPU with a higher top speed, a second serial port, more memory, and a better hard disk. A 30-megabyte drive would make a difference for anyone who wants or needs to take advantage of AT-style computing.

The AMT's real selling point is its price. For \$1,898 list, you get a configuration that's so complete, all you have to add is a monitor. Even the graphics card is included. Sometimes, though, low price isn't enough. The AMT has just-adequate performance and no distinguishing features. It's worth spending a few dollars more to get a machine with fewer flaws and better performance.—Jon Pepper

W IN ATEGA

The WIN ATEGA is a no-nonsense machine with few surprises and few problems. You get a reasonable amount of equipment for \$1,495, a reasonable amount of money: the highly compatible Phoenix ROM BIOS, 512K RAM, one parallel and two serial ports, a dual-speed (6- and 8-MHz) 80286, six available slots out of eight total, a high-capacity floppy, a hard disk controller, a keyboard, and a power supply. For \$2,185, you can get an ATEGA with a 30-megabyte hard disk. The test machine had a 20-megabyte Seagate hard disk and a color monitor.

The ATEGA performed well on the PC



American Micro Technology packages its AT alternative, the AMT AT 286, with two Western Digital quad-density floppy drives next to a standard 20-megabyte hard disk, a Maxi-Switch keyboard, one serial and one parallel port, 640K bytes of RAM, and eight expansion slots.



WIN Laboratories built its ATEGA IBM look-alike around a highly compatible Phoenix ROM BIOS and 80286 dual-speed CPU. Its old-style AT keyboard isn't as nice as the models built by Maxi-Switch, but it's heaven compared with standard IBM issue.

Magazine Labs benchmark tests. I would have preferred a faster, larger-capacity hard disk; the unexciting performance of the Seagate drive is unfortunately a feature of many low-cost compatibles.

The monitor on the test unit was a TVM color model (attached to a CGA-compatible card) with a display that can best be described as fair. The front panel has one nice feature: a unique "multidisplay" switch that changes the display from full color to either green or amber monochrome. However, this capability is really a curiosity rather than a real benefit because neither the green nor the amber display improves on the ragged resolution of the CGA-generated text. The monochrome modes also tend to lose certain details with some programs (for instance, some of the status lines in *SideKick*), which is really an unacceptable trait.

If the ATEGA's label said IBM instead of WIN, the casual user would probably never know the difference. If you added a better monitor and graphics card and a larger, faster hard disk, you would have a reasonably slick setup. The ATEGA's low basic price gives you room to move in that direction. —Jon Pepper



FACT FILE

AMT AT 286

American Micro Technology
14751 B. Franklin Ave.
Tucson, CA 92660
(714) 731-6800

List Price: \$1,898 (tested configuration)

In Short: An 8-MHz AT at a truly remarkable price that includes everything but the monitor. The price, however, does not make up for its just-adequate performance.

CIRCLE 884 ON READER SERVICE CARD

WIN ATEGA

WIN Laboratories
3805 Lake Blvd.
Annandale, VA 22003
(800) 828-2137
(703) 280-2437

List Price: \$2,185 (tested configuration)

In Short: No surprises and no luxuries are in store with the WIN ATEGA. This standard AT compatible performs well and adds few frills, except for a dual-speed microprocessor.

CIRCLE 882 ON READER SERVICE CARD

■ THE CHEAPEST ATs EVER



Low-Cost ATs: Summary of Features

Product/ Manufacturer	Base price	Base price includes	Price of config. tested	Configuration tested	Options
AMT AT 286 American Micro Technology	\$1,249	640K RAM, Western Digital 1.2-Mbyte floppy disk drive and controller card, multi I/O Card	\$1,898	All features of base model, 30-Mbyte hard disk, color/graphics card	30-Mbyte hard disk, \$549; monochrome monitor, \$135; mono/graphics card, \$115
PC SAM3001 HiTech International	\$995	512K RAM, 1.2-Mbyte floppy disk drive, Western Digital hard/floppy disk controller card, choice of mono/graphics or RGB graphics card, multi I/O card	\$2,120	All features of base model, 30-Mbyte hard disk drive package, high-resolution amber monitor	High-resolution amber monitor, \$125
WIN ATEGA WIN Laboratories	\$1,495	512K RAM on 1,024K motherboard, 1.2-Mbyte floppy disk drive, multi I/O card	\$2,185	All features of base model, 30-Mbyte hard disk	30-Mbyte hard disk, \$660; monochrome monitor, \$119; mono/graphics card, \$119; color monitor, \$369; color/graphics card, \$99
Jet-286 Eltech Research Inc.	\$1,450	1 Mbyte RAM, TEAC 1.2-Mbyte floppy disk drive, floppy disk controller card, multi I/O card	\$2,365	All features of base model, 360K floppy disk drive, Western Digital hard/floppy disk controller card, Everex the Edge mono/color/graphics card	Seagate 30-Mbyte hard disk, \$625; TEAC 360K floppy disk drive, \$105; Seagate half-height 30-Mbyte hard disk, \$395; Samsung monitor, \$95; Everex the Edge mono/color/graphics card, \$85
A*Star Wells American	\$1,495	512K RAM, 1.2-Mbyte floppy disk drive, multi I/O card	\$2,395	All features on base model, 1 Mbyte RAM, 30-Mbyte hard disk	30-Mbyte hard disk, \$655; 1.2-Mbyte floppy disk drive, \$190; 360K floppy disk drive, \$139; mono/graphics card, \$119; multi I/O card, \$95; 512K RAM expansion card, \$95; monochrome monitor, \$139
Club AT Club AT Inc.	\$1,295	512K RAM, TEAC 1.2-Mbyte floppy disk drive, hard/floppy disk controller card, multi I/O card	\$2,499	All features of base model, 1 Mbyte of RAM on motherboard, 30-Mbyte hard disk, mini I/O board with second serial port, monochrome monitor, mono/graphics card	512K RAM expansion card, \$54; 30-Mbyte Seagate hard disk, \$648; monochrome monitor, \$135; mono/color/graphics card, \$99; mini I/O with second serial port, \$89; Club 2000 multi-function card, \$179
ANI AT Alphanumeric International Inc.	\$1,795	640K RAM, Toshiba 1.2-Mbyte floppy disk drive, hard/floppy disk controller card, mono/graphics adapter with parallel port, Princeton Graphics Max 12 monitor, multi I/O card	\$2,585	All features of base model, 20-Mbyte hard disk, color/graphics card	20-Mbyte hard disk, \$510; 20-Mbyte tape backup, \$449; Seagate 30-Mbyte hard disk, \$630; 60-Mbyte internal tape backup, \$650; EGA card, \$249
FiveStar AT FiveStar Electronics	\$1,695	1-Mbyte RAM, TEAC 1.2-Mbyte floppy disk drive, Western Digital hard/floppy disk controller card, 12 expansion slots, (six 8-bit, six 8/16 bit), multi I/O card	\$2,670	All features of base model Seagate 30-Mbyte hard disk, EGA card	30-Mbyte hard disk, \$449; 360K floppy disk drive, \$80; monochrome monitor, \$110; mono/graphics card, \$95; various serial and parallel port combinations; EGA card, \$250

Note: All models come with an 80286 processor. **PC** —Indicates Editor's Choice. *According to the manufacturer.

Ports included in base price	Slots	Power supply (watts)	Reset key	Keyboard style	Claimed clock speed (MHz)	Controller card	Warranty	IBM EGA compatible	Above Board compatible	BIOS manufacturer
1 serial, 1 parallel	8	200	No	Old AT	8	Handles two hard disk drives and two floppy disk drives	1 year on mother-board, 90 days all other parts	Yes*	Yes*	Eden Software
2 serial, 1 parallel	8	192	No	Old AT	6 and 10	Handles two hard disk drives and two floppy disk drives	90 days parts and labor	Yes*	Yes*	Pyramid Software
1 serial, 1 parallel	8	192	Yes	Old AT	6 and 8	Handles two hard disk drives and two floppy disk drives	1 year	Yes*	Yes*	Phoenix 1.53
2 serial, 1 parallel	8	200	No	Old AT	6 and 8	Handles two hard disk drives and two floppy disk drives	1 year parts, 6 months labor	Yes	No	Phoenix 80286, Version 1.58
2 serial, 1 parallel, 1 game	8	220	No	Old AT	6 and 8	Handles two hard disk drives and two floppy disk drives	30-day money-back guarantee	Yes*	Yes*	proprietary
4 serial, 2 parallel, 1 game	8	192	No	Old AT	8	Handles two hard disk drives and two floppy disk drives	1 year	Yes	Yes	Award Software 1.05
1 parallel	8	192	No	Old AT	8	Handles two hard disk drives and two floppy disk drives	1 year, 90 days parts and labor	Yes	Yes	Eden Software
1 serial, 1 parallel	12	242	Yes	Old AT	6 and 8	Handles two hard disk drives and two floppy disk drives	3 years	Yes*	Yes*	Not available

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AST RAMPAGE	\$269
AST RAMPAGE AT	\$409
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OKIDATA

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ML193 IBM	\$475
84 IBM	\$635

TOSHIBA

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351P/S	CALL

NEC

P5	\$1149
P6	\$475
P7	\$639

PANASONIC

1091	\$269
1092	\$339

SILVER-REED

EXP 800	\$669
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IBM

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PROPRINTER XL	\$599

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WORDSTAR 2000+	\$289	ENABLE	\$329
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MULTIMATE ADV	\$245	HARVARD TOTAL	\$265
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FiveStar AT

In the world of low-cost AT compatibles, you're sometimes forced to look hard for the subtleties that distinguish one product from another. Removing the cover of the FiveStar AT reveals one difference immediately: this machine has 12 (no kidding) expansion slots. Even after you add all the necessary video and drive controller cards, you will still have 10 open slots. This feature makes the FiveStar an appealing choice for those who plan to add every possible type of expansion card.

The FiveStar is manufactured in Korea, which should be considered a plus. Korean firms are expending a great deal of effort to enforce good quality control.

The machine we tested had 1 megabyte of RAM, a high-capacity floppy drive, one parallel and two serial ports, a Hercules-compatible monochrome graphics card, and a software switch (CPU.COM) to toggle between the 6- and 8-MHz clock speeds. The FiveStar also has a hardware reset switch on the back.

The FiveStar AT's performance is satisfactory. It isn't the fastest machine tested, but it did all we asked without complaint and displayed no software compatibility problems.

It's a little unfair to compare the FiveStar's display—or that of any other machines that came with a Hercules or monochrome card—to the CGA-equipped machines. Suffice it to say that the Hercules-compatible machines produced crisper, more attractive text than the CGA-equipped machines. This, of course,



The FiveStar AT may look like another clone, but underneath the hood one difference is immediately apparent: the machine has 12 expansion slots. Other thoughtful extras include a hardware reset switch on the back and a Maxi-Switch AT-compatible keyboard.



Manufactured by the large Korean firm Samsung, the SAM3001 high-quality components include the Smartek American-made motherboard, a dual-speed 80286 processor, two serial ports, one parallel port, a total of eight slots, and a Maxi-Switch keyboard.



FACT FILE

FiveStar AT

FiveStar Electronics
3220 Commander, #102
Carrollton, TX 75006
(214) 733-4100

List Price: \$2670 (tested configuration)

In Short: The FiveStar AT's abundant expansion slots—12 in all—set it apart from the crowd. Its design and performance are otherwise equivalent to the IBM original and most other compatibles.

CIRCLE 663 ON READER SERVICE CARD

comes as no surprise.

The FiveStar includes the Maxi-Switch keyboard, one of my favorite AT-compatible keyboards. Its touch is good for fast typing, the switch that puts the Esc key back on the left side where it belongs is a godsend, and its feel makes it comfortable for long periods of use.

The 30-megabyte hard disk tested as "meeting IBM specs" on the Core International test. That means it's not as fast as the highest-performance drives available, but it's dependable and not as expensive.

The design and layout of the FiveStar's interior are clean and appear rugged enough to handle whatever add-ons you might want to fill all those expansion slots with. In fact, the abundance of expansion slots is really the FiveStar AT's most distinctive feature. While it performs adequately, is (naturally) low priced, and has the expected AT-compatible trappings, the surplus of slots is its biggest asset—if you need the room.—**Jon Pepper**

S AM3001

Although HiTech International's SAM3001 closely mimics the IBM PC AT in form, enough differences lurk under its skin to hint at individuality. These differences help the SAM3001 outperform several of its competitors.

The SAM3001's processing power comes from a dual-speed CPU that operates at either 6 or 10 MHz. You select the speed through the keyboard by simultaneously hitting the Enter-Ctrl-Alt combination with the Plus key to speed up or the Minus key to slow down. The SAM3001 always powers up at its slow speed, which I found a bit annoying. And if you happen to have something like *SideKick* in an AUTOEXEC.BAT file, you may bring that program up unexpectedly while trying to change speeds.

The American-made motherboard (from Smartek) comes with 1 megabyte of RAM standard, along with the 80286 processor, two serial ports, one parallel port, and eight slots total (six open). The standard video card is a Hercules-compatible monochrome graphics card. HiTech offers a 30-megabyte, full-height Seagate hard drive along with the standard TEAC high-capacity floppy.

The keyboard, a particularly admirable model from Maxi-Switch, is both plug-and-layout-compatible with the IBM model, including lighted indicators for CapsLock, NumLock, and ScrollLock. The keyboard's feel is especially nice: tight, crisp, and with good tactile feedback. It has raised "finder bars" for the F and J keys and the 5 key on the numeric pad. But its best feature has to be the option to change from XT to AT layout with the flip of a switch on the underside of the keyboard. Changing to the XT setting will mercifully put the Esc key back on the left side of the keyboard (swapping locations with the Tilde key). It's an option that every AT keyboard should have.

The documentation, sparse but sufficient, mainly tells that you need to have your own copy of DOS to format the hard disk, something you need to operate any of these machines legally.

The SAM3001 could use a front-mounted hardware reset switch: on a few occasions during testing, the machine hung up and wouldn't perform a Ctrl-Alt-Del reboot. But except for a few minor faults, the SAM3001 is a fine machine. It presents no compatibility problems, performs handily at 10 MHz, and seems at least as rugged as any other machine in its class.

The SAM in SAM3001 comes from Samsung, and the backing and manufacturing reputation of this huge Korean firm might well be considered a plus by users who are prone to wondering where their AT compatibles really come from. The SAM3001 merits consideration for users who want AT performance—and then some—without the price tag.

—**Jon Pepper**



FACT FILE

SAM3001

HiTech International
1180-M Miraloma Way
Sunnyvale, CA 94086
(408) 738-0601

List Price: \$2,120 (tested configuration)

In Short: A reliably built AT compatible with a dual-speed microprocessor, an excellent keyboard, and just few drawbacks.

CIRCLE 66 ON READER SERVICE CARD

J et-286

Like the hare that lost to the tortoise, the Jet-286 can run substantially faster than most of the other clones but falls short in some crucial areas, such as hardware compatibility. The Jet-286's base configuration includes a 6- or 8-MHz 80286 CPU, 1 megabyte of RAM, a TEAC 1.2-megabyte floppy disk drive, a Western Digital hard/floppy disk controller, and three I/O ports (two serial and one parallel). The suggested retail price of this configuration is \$1,450; the enhanced version with a

■ Like the hare that lost to the tortoise, the Jet-286 can run faster than most of the other clones but falls short in some crucial areas.

hard disk lists for \$2,365.

One notable feature of the Jet-286 is its BIOS: it includes the highly compatible Phoenix 80286 ROM BIOS.

The Jet-286 looks like an IBM PC AT from the front, but it has three DB-25 connectors extending through cutouts on the rear panel. The unit appears to be solidly built, but expansion boards do not seat properly in the expansion slots since the system board is about 1/4th of an inch lower than it should be. To circumvent this problem, I used a screwdriver to raise the system board before inserting an expansion board.

The system board of the Jet-286 is about 10 percent larger than that of the IBM PC AT. The power supply covers the battery and a connector for one integral serial port. All three I/O ports are built into the system board, which saves at least one slot and the expense of an expansion card.

The motherboard uses jumpers instead of DIP switches. You can use the jumpers to configure your system for such features

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as monochrome or color display, zero or one wait state, and 6 or 8 MHz and to enable or disable I/O ports. There are also jumpers for indicating whether the system is using 64K- or 256K-bit RAM chips. Unfortunately, the memory jumpers cannot indicate how much memory is on the board, which causes problems when you try to use an Intel Above Board with the Jet-286. The technical support staff at Eltech Research was friendly but couldn't help us with the problem, of which they were not previously aware. They offered various solutions, none of which worked.

The keyboard, a Taiwanese version of the older AT keyboard, has a slight resistance to the touch about halfway through the stroke, which I found to be just fine for typing.

SCRUNCHED-UP CHARACTERS The Samsung monitor that came with the review unit had an excellent display. The monitor's only problem surfaced when I invoked the video adapter's 132-column mode: characters appeared to be scrunched up on the right side of the screen. The display adapter, Everex's Edge, has some interesting features. It can display monochrome and color graphics and offers several different display modes, one of which is 132 columns by 44 lines. This board had intermittent problems, however, and finally had to be replaced.

The Jet-286 runs at a higher speed than some of the other clones, thanks to the jumper that lets you switch it to a zero-wait-state machine. This capability, which requires the 120-nanosecond dynamic RAM chips that were included with the



The front of the Jet-286 looks like an IBM AT, but the rear differs with three DB-25 connectors extending through cutouts on the back panel. Inside, the system board is about 10 percent larger and the three I/O ports are built into the board to save a slot.



*Designed and assembled in South Carolina, the Wells American A*Star offers satisfactory performance with its dual 6- and 8-MHz speed CPU (12-MHz clock speed is optional), a hefty 220-watt power supply, and the stiff-but-familiar PC-like keyboard.*



FACT FILE

Jet-286

Eltech Research Inc.
318 S. Abel St.
Milpitas, CA 95035
(408) 942-1260

List Price: \$2,365 (tested configuration)

In Short: The positive effect of the Jet-286's zero wait state speed is offset by problems with hardware compatibility, the chassis, adapter board, and technical support.

CIRCLE 881 ON READER SERVICE CARD

system, increases the speed of the machine by about 30 percent over its one-wait-state mode. (PC Magazine Labs speed tests are designed for one wait state.)

The machine includes Compaq MS-DOS 3.1, a setup disk, and two utility disks from Everex for the hard disk and video adapter. Documentation for the Jet-286 is photocopied and, in some cases, not relevant to the machine. For example, it describes switch settings rather than jumper settings. Printed documentation from Everex is included for the hard drive and display adapter.

Overall, the Jet-286 disappointed me. Although it includes some nice features, such as the wait state jumper, these are offset by the problems with the chassis, the video display board, and hardware compatibility with the Intel Above Board. However, only the Above Board problem is a critical one, and then only if you need extended memory. —Joe Desposito

A*Star

The A*Star from Wells American may not be quite as all-American as its name implies, but having some sourced-out parts is not necessarily a debit. The company does design and build its own motherboard and assemble the final product at its South Carolina plant, while still managing to stay price competitive.

The basic system, called the Model 100, includes a 6- and 8-MHz CPU, a hefty 220-watt power supply, room to bump the 512K RAM up to 1 megabyte, and the other amenities you'd expect from a machine in this class. Wells American saves a

■ While the Wells American A*Star didn't quicken my pulse with excitement, it's not soporific, either.

slot by integrating the hard disk controller into the motherboard; you will need to use one of the eight slots for a video card, leaving you with seven available slots.

The Model 200, which includes a 20-megabyte drive but no monitor, lists for \$1,945, and a 30-megabyte model is also available. Perhaps of more interest is the 12-MHz clock speed option (for \$495) that was announced at press time. We reviewed the Model 300, which lists for \$2,395 and includes a 30-megabyte hard disk.

While the A*Star didn't quicken my pulse with excitement, it's not soporific, either. Its performance is on a par with any of the 8- or 10-MHz machines, and it is as compatible as the best units tested.

The A*Star's drawbacks are fairly minor: you must reset the computer to change speeds, and it lacks a hardware reset switch. The keyboard feels a bit stiff, and its tactile feedback and keycap design are too close to those of the original PC keyboard for comfort. Of course, if you are one of the few people who like the original PC keyboard, you'll like the A*Star's version, too.

One important issue for anyone buying an AT-compatible clone (or almost anything else) by mail order is faith and trust in your vendor. You have no chance to try the machine out, and you won't find out until after you've bought it if its little nuances don't make you happy.

Wells American has obviously thought about this, too: the company offers a complete money-back guarantee (within the first 31 days after purchase)—an offer that eliminates a large measure of buyer risk and gives you a chance to evaluate the machine before making a commitment. It's

also enough time for any manufacturing defects to surface.

The A*Star also gives you a chance to buy into the AT world without spending a lot of money. Its money-back guarantee is commendable and should be available with any mail-order computer. With the 12-MHz kit and an EGA card, the A*Star has the potential to be a low-cost whiz.

—Jon Pepper

Club AT

Although the name Club AT may conjure up images of exotic vacation spots, it's the moniker for a straightforward AT compatible. The base system includes an 80286 microprocessor running at 8 MHz, a 1.2-megabyte TEAC floppy drive, 512K RAM, and a Western Digital hard/floppy disk controller. The price of this package is \$1,295; \$2,499 adds a 30-megabyte hard disk, monitor, display adapter, and several other frills.

The Club AT logo on the front and three DB-25 cutouts on the back are the only superficial features that distinguish this imitator from the IBM original. Removing the system cover, however, reveals a few more differences. Four banks of RAM hold up to 1,024K bytes, and two switches allow you to configure the system for 256K, 512K, 640K, and 1,024K.

The Club AT appears to be solidly built and correctly aligned. We had no problems inserting expansions cards into the slots. The system board is about 10 percent larger than the IBM version; a small part of it lies under the power supply, but nothing

PC MAGAZINE FACT FILE

A*Star
Wells American
3242 Sunset Blvd.
West Columbia, SC 29169
(803) 796-7800

List Price: \$2,395 (for the Model 300) (tested configuration)

In Short: A standard-issue compatible with satisfactory performance and an attractive money-back guarantee.

CIRCLE 67 ON READER SERVICE CARD

PC MAGAZINE FACT FILE

Club AT
Club AT Inc.
46707 Fremont Blvd.
Fremont, CA 94539
(415) 490-2201

List Price: \$2,499 (tested configuration)

In Short: Although the Club AT performs well, its poor monitor display, substandard keyboard, and slight hardware incompatibility with the IBM EGA board are reminders of the risks involved when purchasing low-cost computers.

CIRCLE 67 ON READER SERVICE CARD

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The 128K **NOP** benchmark test is designed to measure raw clock speed and memory access time while minimizing differences in microprocessors and the effect of memory caching. This test executes almost nothing but NOP ("No Operation") machine code instructions in a big 128K-byte loop.

The **Floating-Point Calculation** benchmark test measures processor speed by looping through a series of floating-point calculations, including multiplication, division, exponentials, and logarithmic and trigonometric functions. This test program uses the floating-point library included with Microsoft C Compiler 3.0.

The **Conventional Memory** benchmark test allocates 256K-bytes of conventional memory and treats it as a series of 64-byte records. Then 16,384 random records are read into and written from this memory. The results show the average of the read and write times.

The **Extended Memory** benchmark test allocates 256K bytes of extended memory and treats it as a series of 64-byte records. Then 16,384 random records are read into and written from this memory. The results show the average of the read and write times.

The **Disk Access** benchmark test from Core International measures the hard disk's seek time, or how fast the drive responds to the disk controller's instructions (in milliseconds). The test program performs three measurements on the speed at which the drive head moves: track to adjacent track, track to randomly selected track, and the average of a series of random track accesses. Only the results for a series of random track accesses are shown here.

The **1-2-3 Routine** benchmark test for spreadsheet applications, designed for a 640K-byte environment, assesses the computational speed and RAM management capabilities of the machine by using a 1-2-3 macro that performs a series of both global and individual worksheet tasks. The macro copies and recalculates a 10-cell range 499 times, moves 1,000 cells, deletes 1,000 cells, and then systematically clears the spreadsheet.



Benchmark Tests: Low-Cost Compatible ATs

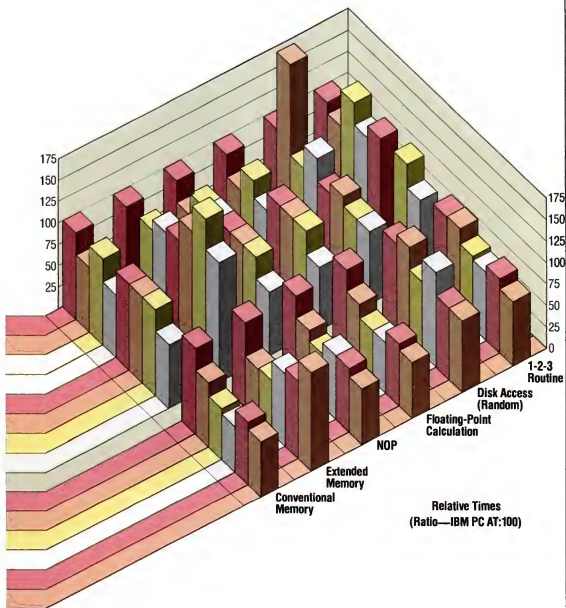
Performance Times (Times given in seconds and decimal seconds)

Product (5 MHz)	Price as Tested	Conventional Memory	Extended Memory	NOP	Floating Point Calculation	Disk Access (Random)	1-2-3 Routine
IBM PC AT	\$5,295	1.80	15.65	5.58	46.61	34.79	74.31
AMI AT	\$2,585	1.35	-	4.17	34.99	66.62	66.00
SAM3001	\$2,120	1.79	16.12	5.58	46.63	29.33	97.00
WIN ATEGA	\$2,185	1.31	17.96	5.55	36.96	38.88	78.00
Jet-286	\$2,365	1.79	19.00	5.60	46.58	29.34	88.00
FiveStar AT	\$2,670	1.79	23.07	5.60	46.96	33.39	**
A+Star	\$2,395	1.79	27.60	5.58	46.63	29.38	88.00
Club AT	\$2,499	1.32	22.05	4.17	34.36	29.71	67.00
Product (8 MHz)							
IBM PC AT	\$5,295	1.80	15.65	5.58	46.61	34.79	74.31
AMT AT 286	\$1,898	1.37	9.33	4.17	34.99	38.28	76.00
SAM3001***	\$2,120	1.06	9.72	3.41	27.63	29.27	62.00
WIN ATEGA	\$2,185	0.95	13.41	4.20	27.30	38.88	59.00
Jet-286	\$2,365	1.31	14.28	4.17	34.28	29.28	65.00
A+Star	\$2,395	1.17	18.05	3.71	30.32	29.38	57.00

*Extended memory was not available.

**The monitor supplied with the unit would not display 1-2-3.

***The SAM3001 ran at 10 MHz.



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of import, like a battery, is hidden away under there. A pack of four AA batteries for the CMOS RAM is taped to the side of the power supply.

The machine includes a 6-MHz crystal for software that needs to run at the slower speed. This crystal resides on the system board in a tight spot behind the hard drive. It seems possible to replace the crystal without removing anything, but you'd probably have to move the hard disk out of the way first.

The keyboard is made in Taiwan in the image of the older IBM PC AT design. Its keys resist the touch slightly and rattle a bit when pressed. I found the keyboard below average for typing.

A Tatung green-phosphor monochrome monitor came with the review unit. The focus of this display needed an adjustment, but unfortunately there was no way to make it without opening the case. The power and adapter cables of the monitor were so annoyingly short that the monitor could only be placed right on top of the system unit. The display adapter included with the Club AT was the Everex Edge monochrome and color/graphics adapter.

The Club AT is a good example of the problems that can arise when you purchase a low-cost mail-order computer. The monochrome display was decidedly inferior, and the keyboard was substandard. An EGA board that worked perfectly well in other AT computers didn't work in the Club AT, while a duplicate board worked fine. Problems like these are minor annoyances that you can live with or fix, and that you may not even run into on a different unit. The Club AT's low price and blazing speed may be appealing enough to outweigh its drawbacks. —Joe Desposito

A NI AT

The ANI AT is a straightforward AT compatible with a base system price of \$1,795. That price includes an 8-MHz 80286-based computer with a Toshiba 1.2-megabyte floppy drive, 640K RAM, a Princeton Graphics Systems MAX-12 monochrome monitor, a monochrome/graphics adapter, and a Western Digital floppy/hard disk controller. Adding a hard disk takes it just over the \$2,500 mark.



At first glance, the Club AT is indistinguishable from the original IBM AT. Inside, however, four banks of RAM chips hold up to 1,024 bytes and two switches configure the machine for 256K, 512K, 640K, and 1,024K.



ANI uses an original-AT-style keyboard from Maxi-Switch Co. It has a slight initial resistance to the touch, and should be comfortable for long periods of use. The Esc and Tilde keys can be swapped using a switch underneath the keyboard.

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■ THE CHEAPEST ATs EVER

Like many compatibles, the ANI AT looks just like IBM's version, except for the logo. Around the back of the computer, the ANI has special cutouts for three DB-25 connectors and two DB-9's (in addition to the expansion slot openings)—a particularly useful feature for those extra connectors that can be attached by cable to multifunction boards.

The ANI AT's system board is about 20 percent larger than the IBM board. The board slips under the power supply, which is not a problem except that the batteries for the unit's CMOS RAM are under there. When the batteries need to be changed, you must remove the power supply. You can avoid that, however, by using a battery backup pack that connects to the system board.

Another point where ANI's system board differs from IBM's is its RAM capacity of 1 megabyte. Although the unit comes with 640K bytes on board, two of the four rows of RAM chips contain 64K-bit chips that can be replaced by 256K-bit chips. However, the ANI board has the same number, type, and placement of expansion slots.

The evaluation unit contained a Seagate ST-225 20-megabyte hard disk drive, a low-performance drive (66-millisecond access time) that helps to keep the total system price down. This ST-225 drive costs \$350 when purchased with the system; a high-performance drive would run \$215 more.

The test ANI AT unit included a Prince-ton Graphics Systems MAX-12 amber monitor with a display that can only be rated as fair. Text quality varied from the cen-



EDITOR'S CHOICE

None of these eight AT alternatives is likely to start your adrenaline pumping, but all are worthy contenders. HiTech International's SAM3001 stands out for several reasons. Its components, especially the Maxi-Switch keyboard, are of high quality. Its clock runs at 6 and 10 MHz, giving it a speed advantage. And the backing of the Korean company Samsung makes it a fairly low-risk purchase.

*Wells American's A*Star deserves special mention for its money-back guarantee and 12-MHz option. And if you're looking for the lowest price for the most equipment, pay special attention to American Micro Technology's AMT AT 286.*

ter to the edges of the display, and a noticeable wave ran through one line of text.

Overall system performance is quite excellent. Thanks to its 8-MHz 80286, the ANI AT zipped through the Labs benchmark speed tests. The compatibility test uncovered neither hardware nor software problems. For users concerned with machine wait states, the board is configured for one wait-state operation. If you desire zero wait-state operation, Alphametric will provide it for an additional \$300.

Besides an 8-MHz system board, Alphametric also markets a 6- or 8-MHz version for an extra \$295 and a 10-MHz version for an additional \$325. The 10-MHz version includes 1 megabyte of RAM on its motherboard.

The ANI AT appears to be well built, and I was pleased with its performance. Its monitor is disappointing, and it's worth your while to spend the extra \$250 for a high-performance hard disk drive. These reservations aside, I can recommend the ANI AT to anyone considering an AT compatible. —Joe Desposito

Jon Pepper is a frequent contributor to PC Magazine. Joe Desposito is a free-lance writer specializing in computer software and hardware.



FACT FILE

ANI AT

Alphametric International Inc.
14060 Gannet St., # 1-103
Santa Fe Springs, CA 90670
(213) 921-8689

List Price: \$2,585 (tested configuration)

In Short: Overall performance is excellent, though the display had some problems and the included hard disk drive was not a high-performance one.

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ANIMATI CORPORATE PRESENTATIONS

Movement and three-dimensionality add impact to your company's presentations and promotions. And with the first generation of AT-based systems, animations created in-house are becoming practical.

ANIMATED VIDEOS ARE A COMMON and effective promotional tool that many companies use to build their corporate images or to raise employee morale. Typically, 3-D animation is used to create a company logo, then zoom, flip, and rotate it through a "high-tech landscape" such as a grid. But other creative corporate applications are popping up everywhere

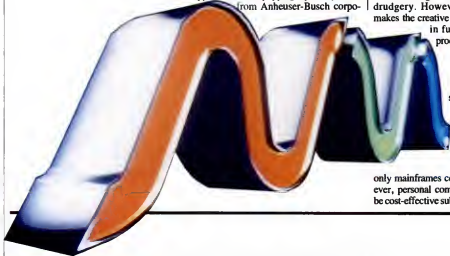
from Anheuser-Busch corpo-

rate presentations to rock videos (see sidebar "Animation at Work"). Corporations know the value of stimulating imagery in getting a message across, and computer animation can deliver that imagery.

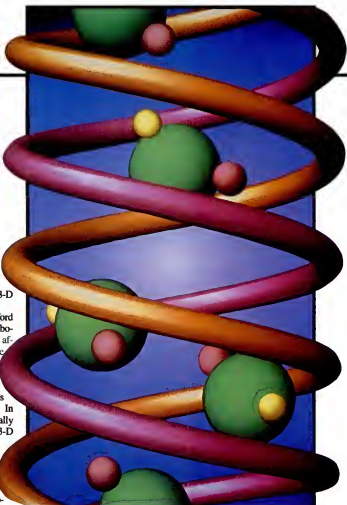
Computers are natural tools for creating animated sequences: they can render and move images faster than a human being can, relieving artists of time-consuming drudgery. However, the human artist makes the creative decisions and remains in full control of the end product.

Although it's a snap for computers to produce the 30 frames per second required for smooth image movement, computerized animation requires intensive computing power and massive storage that until recently

only mainframes could offer. Now, however, personal computers have proven to be cost-effective substitutes, capable of the



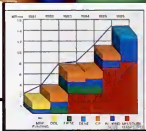
N G



number-crunching speed needed for 3-D animation.

Many corporations that could not afford the time or expense needed to create elaborate mainframe-based animations can afford the \$30,000 to \$60,000 purchase price of a complete PC-based animation system. This price generally includes everything but the professional-quality video tape recorder, which is priced between \$2,000 and \$30,000. In fact, one outside-produced video generally costs as much as an entire PC-based 3-D animation system.

FOUR STEPS The four-step animation process is essentially the same whether you do it manually or with a computer. You design a character or object; develop a "script sheet" of key frames for movement; create a "pencil test" (outlines) for viewing the flow of movement; and create a fully rendered set of images for recording on film or video. In computer animation, each of these steps represents one program; the programs share files.



■ ANIMATION SYSTEMS

PC-based animation systems are surprisingly complex. An understanding of video technology is almost essential because they are video animation systems first and computer systems second. But don't let their complexity scare you away: these powerful tools can offer great flexibility in the creative process.

Each of the three PC-based animation systems reviewed here includes an 8-MHz AT (Image-Maker includes two), a high-resolution adapter such as one of Number Nine's Revolution series or AT&T's Targa series, a compatible RGB analog monitor, between 2 and 4 megabytes of extra memory on an expanded or extended memory board with VDisk for buffering images or sorting objects, serial ports, a mouse or tablet for input, a single-frame controller, and a color encoder. The specific components depend on your needs; the manufacturers will configure their systems for your applications. The only hardware you need to add is the video tape recorder.

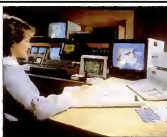
The single-frame controller, attached to the AT through a serial port, sends an audio signal to the video tape recorder, initializing 30 frames per second on the video tape audio channel. It then listens to that audio signal to find out at which frame it is located. RGB display output from the computer is sent to a color encoder to ensure color stability. The sync signal transmitted by the computer is sent to a sync generator and then to the color encoder. The video signal out of the color encoder is then sent to the video tape. (For more information on the video signal and equipment see the sidebar "From Computer to Tape").

West End Film's West End Animation System, Integrated Technologies' Image-Maker, and Cubicomp Corp.'s PictureMaker/30 represent the first wave of PC-based animation systems. More products are in the works, but this first group is an extremely promising one. Most industry observers had doubted the PC's ability to create animation, but these innovative systems have proved the doubters wrong.

Hardware performance for these three systems is essentially the same; it's their software that distinguishes them. This software handles all four stages of the ani-



Integrated Technologies' Image-Maker



The PictureMaker/30 from Cubicomp Corp.

mation process: object creation, rendering, scripting, and video tape control.

OBJECT CREATION Creating the objects that will move is the root of animation. An object can be as simple as a box, a letter of the alphabet, or a single line. A group of simple objects can add up to a more-complex larger object. For example, a head, a single object, is also a grouped object consisting of the lines that form the ears, nose, lips, eyes, and hair, attached to a spherical shape that forms the head.

To create an object, you draw a basic two-dimensional shape using some simple commands such as line, box, circle, polygon, or grid. For example, the first step in creating a sphere is to draw a half circle (see Figure 1). You can then modify the half circle to occupy three dimensions. Using a rotation command, you can replicate the shape any number of times around a chosen center of rotation. For a relatively smooth sphere, you may choose 20 or more sections rotating around the center of the circle. But, if the ends of the arc point to the left and you choose a center to the left of those points, you will create an ellipse with a hole in the center.

RENDERING TECHNIQUES Generally, the object you create is in *wireframe* mode; the replicated points and the lines that connect those points look more like a framework of wires than a solid object. You can then modify this framework to make it look more solid by using one of a number of techniques. Hidden-line removal will keep the object as a wireframe but will remove lines that are on the reverse side. *Flat shading* will color in the individual polygons created by the rotation; you

define a "light source" that tells the computer how to shade the object—the polygon at zero angle to the light source will be brightest and the polygon at 180 degrees will be darkest, with those between shaded in appropriate gradations.

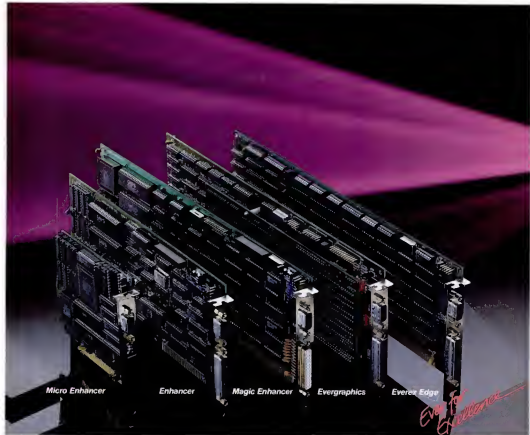
Smooth shading is a rendering technique similar to flat shading, but instead of discretely shading each polygon it blends the colors of adjoining polygons. This technique avoids the blocklike appearance resulting from a flat-shaded rendering.

Texture mapping, probably the most elegant form of rendering, allows you to paint the contents of an *image file* across a polygon or a series of polygons (see Figure 2). This file may contain an image you created with the paint program or captured with a video digitizer.

Antialiasing, another rendering technique, removes any of the "jaggies," or jagged edges, created by the limits of display resolution. Antialiasing blends the edges of each polygon to those of the adjoining polygon or object, creating a more realistic look.

OBJECTS WITH WEST END The West End Animation System offers all of these object-rendering options in its object-creation package, *Artwork*. You create *reference objects* in folios, which are comparable to reference cards in a library. You can file the folios to disk as *object cells* carrying the .CEL filename extension. Because you can save every step of an object's creation, from first shape to fully rendered object, object editing is simplified.

The software is neatly broken down into menus and submenus that lead you through the object-creation process. The



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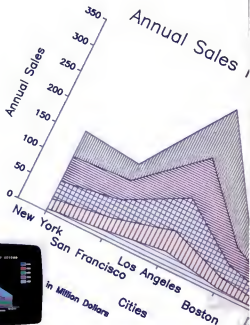
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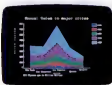


2



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FACT FILE

West End Animation System

West End Film Inc.
1825 Q St. NW
Washington, D.C. 20009
(202) 232-7733

List Price: Animation station, \$29,500;
Videowork software, \$5,950; Artwork
software, \$2,950

Requires: Frame-controllable video tape
recorder.

In Short: A low-priced PC-based
animation system that offers full features at
amazing speed. A strong interactive
editing feature for motion scripting is this
system's highlight.

CIRCLE 66 ON READER SERVICE CARD

Dra (short for drawing) menu contains commands for creating shapes and selecting fonts. Any shape that you create and intend to extrude must be a polygon. The Artwork program lets you turn your shape into a polygon by hitting the Esc key or by editing the shape in the Edit submenu, where all 2-D point editing is done. The Disk menu holds the command choices for storing and retrieving objects and images from disk. In the Mod (short for modify) menu, you turn 2-D objects into 3-D objects and move shapes or objects in 3-D space. These menus and the color palette remain on screen at all times. You may wipe the menus off the screen at any time to view the image by hitting W.

At any stage of creation, you can save shapes or objects. This feature allows you to experiment, back up a few stages if necessary, and then retrieve an original shape or object. Once you understand the concepts involved in working in three dimensions, converting a shape into a solid is quite simple. After selecting the folio or folios in which your shape is stored, you may then extrude or rotate the shape—the process is intuitive.

You use the 3-D submenu to do texture mapping. Again, the flow of commands is easy to follow. Unfortunately, although you can texture-map individual polygons, you can't map one texture onto a group of polygons. If, for instance, you tried to place a map of the world onto a sphere, the entire map would appear on each individ-

ual polygon. West End is currently working on full-object mapping.

Artwork includes 12 vector fonts; other fonts are available at an additional charge. These characters are complete polygons ready for manipulation. You can extrude the characters to give them depth and make them appear solid. Unfortunately, the coloring of typefaces is inconsistent once you have extruded the type. Ideally, the faces of all the 3-D characters should be colored with the same intensity when they are placed at the same angle to the "light source." Unfortunately, the faces of some of the characters are shaded darker than others. According to a company spokesman, new fonts that eliminate this problem are under development.

PICTUREMAKER'S OBJECTS

Cubicomp's PictureMaker system offers all of these features, yet the path to creating a 3-D image is much longer than with the West End Animation System. This product clearly was originally designed for engineers: you must refer to all points as numeric coordinates. This system does not make for an intuitive artist's tool. Once you've mastered its mathematical interface, however, PictureMaker can handle much more complex objects than the other PC-based systems can. Although the rendering of objects is extremely time-consuming, the final results are nothing less than astonishing. PictureMaker handles



FACT FILE

PictureMaker/30, Model 331

Cubicomp Corp.
21325 Cabot Blvd.
Hayward, CA 94545
(415) 887-1300

List Price: \$49,500

Requires: Frame-controllable video tape
recorder.

In Short: A comprehensive object-creation
system with some weakness in animation
facilities. The object-rendering techniques are
clearly superior in this system.

CIRCLE 66 ON READER SERVICE CARD

the nuances of light and shading with near-perfect accuracy.

PictureMaker has four texture-mapping options: it can map a texture onto a single polygon within an object; map the same texture onto all polygons as individuals; map one texture onto the object's polygons as a group; or map a texture onto a very complex shape, like a twisting leaf. A nice feature of PictureMaker's texture-mapping functions is that you can choose an area of the image file to be mapped; unlike in West End's Artwork, you aren't restricted to the full-screen image.

PictureMaker's on-line help facility is quite good. At any time, you can call help screens from any part of the menu tree. The descriptions are well written and

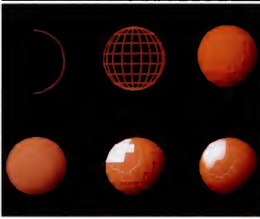


Figure 1: The process used to create a sphere with an animation program. First, an arc (top, left) is drawn with an arc or circle command. That arc is then rotated around its center to create a "wireframe" sphere (top, center). That wireframe object may then be turned into polygons (top, right). The bottom row shows three forms: smooth shaded, flat shaded with highlight, and smooth shaded with highlight.

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■ ANIMATION SYSTEMS

clearly explain the steps in whatever process you are using.

IMAGE-MAKER'S OBJECTS The object-creator program in Integrated Technologies' Image-Maker offers easy-to-use menus and submenus that simplify the creation process. This part of the system, called the Artist's Workstation, occupies one of the two ATs that Image-Maker uses.

Image-Maker is geared to artists rather than engineers. You place objects on-screen visually rather than by entering numeric coordinates. Aside from drawing the actual shapes you desire, the program is structured so that you make all menu selections from the keyboard.

To turn an object in 3-D space, for example, you issue the commands Tumble (for X rotation), Flip (Y rotation), or Zoom (Z rotation). While these commands are, in some cases, easy to understand, a more mathematically oriented person would probably prefer the geometric descriptions.

The on-line help menus are extremely well documented and are so complete that you may not need the instruction manual. The help facility is not available at all points; you must return to the main menu to access it—far less convenient than PictureMaker's flexible setup.

Image-Maker's object-rendering functions are excellent. You can render different parts of a single object in different ways, a feature no other system has. Envi-

■ With Image-Maker you can render different parts of a single object in different ways, a feature no other system has.

ronmental mapping and surface mapping are available (surfaces available include gold, aluminum, bronze, and chrome).

The paint program in an animation system has two basic purposes: to create backgrounds for animated scenes and to create image files for texture mapping. This branch of the program also controls and manipulates video digitizing.

Don't confuse animation paint programs with the standard paint programs available for the CGA and EGA cards. Animation paint programs generally command a display resolution of 512 by 480 and a range of colors anywhere from 32,000 to 16,700,000. Features include smooth-rendered airbrushes, multiple fills, full-color patterns, color spreads, blends, warps, 2-D perspective, anti-

aliasing, and much more.

At press time, the West End Animation System paint program, *Brushwork*, was still in a beta-test form, although it does come with the system. Too many features were still missing for the program to be useful. A West End spokesman suggested using AT&T's *Truevision Image Paint Software (TIPS)*. Since, like *TIPS*, West End uses the AT&T Targa graphics adapter, you can capture *TIPS* images with *Brushwork* using the screen buffer. *TIPS* is a full-featured, easy-to-understand, and fun-to-use paint program (see "AT&T's Wonder Boards," *PC Magazine*, Volume 5 Number 6).

PictureMaker uses a *TIPS* derivative for its paint program. *TIPS* is quickly becoming a benchmark for paint programs; it's no wonder that hardware manufacturers with integrated paint programs choose it. *TIPS* developer, Island Graphics Corp. of Sausalito, California, has slightly modified the program for the PictureMaker animation system.

The Image-Maker system has no paint program to speak of at this time, though one is in development. The paint feature it does have, background spread, is limited to a horizontal, a restriction that will impede your creativity a bit. You can put either a spread of horizontal colors or black space behind your objects. A company



FACT FILE

Image-Maker

Integrated Technologies Inc.
3821-F S. George Mason
Falls Church, VA 22041
(703) 578-1811

List Price: \$59,500

Requires: Frame-controllable video tape recorder.

In Short: An intuitive, easy-to-use system. Its strength lies in its dual-AT processing through a local area network and its extremely fast wireframe rendering. It creates too many files, however, absorbing large amounts of data storage.

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Figure 2: Texture maps may be applied to the surface of an object to create detail within a polygon. The photos in the background were mapped onto four flat planes. A yellow flower pattern, created in a paint program, was mapped onto the female character (upper left) to look like a dress. A piece of fabric was digitized to create the blue-gray texture map on the male character on the right.

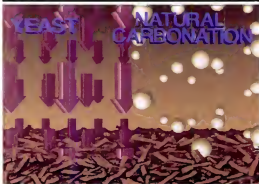
ANIMATION AT WORK

These three companies are using AT-based animation systems to animate everything from company logos to bar graphs.

Mike McCulley, senior art director at Busch Creative Services (a subsidiary of Anheuser-Busch of St. Louis, Missouri), finds that the blackboard and the overhead projector are outdated presentation tools. The Fortune 500 company for which he designs business presentations, promotions, logos, and more is looking for state-of-the-art videos. Toward that end, Busch Creative has installed a Cubicomp PictureMaker system. "The system is enabling us to produce 10- to 20-second sequences in-house for under \$10,000 in production costs. That's at least one-third to one-half the cost of going to an outside production facility," says McCulley.

Omnific, a New York-based video service, uses the Image-Maker system from Integrated Technologies. The 3-D computer animation system leaves Ken McAll, a computer graphic designer at Omnific, much more time to design. He spends less time doing production because his computer can record the video frames overnight. McAll's clients generally don't realize the difference between this system and some of the more-conventional video-effects tools. McAll finds that he must explain in detail that the objects he creates really are 3-D.

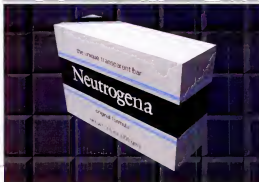
Duda Design, a Pacific Palisades, California, corporate communications company, installed a West End Animation System to service corporate clients. Designers at Duda use the system for everything from logo treatments and lead-ins to 3-D animated bar graphs to full 20-minute videos. Jim Hillin, a computer graphic designer, comments that 3-D computer graphics can convey an idea much more easily than conventional presentations. Clients seek "anything that will catch the eye," he says, "and computer graphics can produce eye-catching visuals." Hillin also notes that video titles are much faster and easier to produce using a computer. —Gerard Kunkel



Busch Creative Services (a subsidiary of Anheuser-Busch) uses Cubicomp Corp.'s PictureMaker 30 to create in-house promotions such as this frame from an animated video on the process of making beer.



This spinning top was created with Image-Maker by Omnific, a video production/design studio in New York.



Jim Hillin of Duda Design in Pacific Palisades, California, used the West End Animation System to create this three-dimensional package. He first made the box and then "texture-mapped" the label onto its surface.

Over half-a-billion




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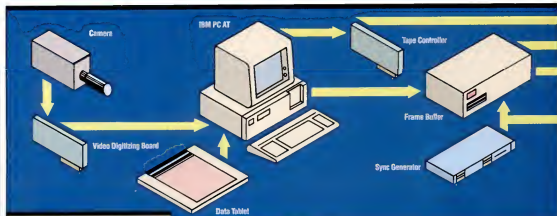
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■ ANIMATION SYSTEMS



PC-Controlled Video Animation System

An 8-MHz AT can support a sophisticated system for creating 3-D animations. Most of the hardware and software illustrated here is included in the system price, including the AT itself. In most cases, all you need to add is the video tape recorder.

spokesman anticipates a full-featured paint program by year's end.

MOTION SCRIPTING In the motion-scripting program, you actually begin to see movement. The characters you have created in the object-creation program will perform against a backdrop you painted in the paint program.

Just as a Broadway play has a script, so must an animation. Even if the animation is nothing more than a logo that zooms in from outer space, you need a script to tell the computer where, when, how fast, and how long. Working with a computer, you don't have to define each frame of motion.

The computer simply needs to know the "key frames" of movement, a process called *key framing*. Once you have made the basic decisions for your key frames, the computer will fill in the rest.

The motion-scripting software refers to the objects you have created exactly as you last stored them in the object-creation program. They will appear on-screen at exactly the same location in which you stored them. When setting up motion you will want to consider where an object was stored and then adjust accordingly.

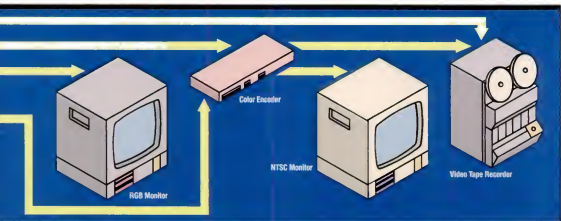
The West End Animation System shines at motion scripting. Its on-screen graphic display of a motion-scripting sheet



3-D Animation Systems: Summary of Features

Product/Manufacturer	Price	COLOR AND LIGHT					DISPLAY COMPATIBILITY				FRAME BUFFER		SOFTWARE FEATURES					
		Total display palette	Total palette	Transparency	No. of light sources	X, Y, Z position control	Special high-lighting	Masks of display board	NTSC	RGB output	Resolution (pixels)	Frame storage capacity	Creates objects in global coordinates by	Sorts objects by	Extra-rotation	X, Y, Z rotation	Multi-axis rotation	Perspective drawing
West End Animation System West End Film	\$29,500 (software extra)	32,000	32,000	●	2	●	●	AT&T TARGA 16 or Number Nine Revolution 8	●	●	512 x 480	Unlimited	●	Folios	●	●	●	●
Picture-Maker/30, Model 331 Cubecomp Corp.	\$49,500	65,536 and 4,096*	16.7 million	●	5	●	●	Proprietary	●	●	512 x 480	Limited by memory	●	Segments	●	●	●	●
Image-Maker Integrated Technologies	\$59,500	512	16.7 million	●	6†	●	●	Vectoria PC, Number Nine Revolution 24	●	●	672 x 480 and 512 x 480	Limited to 20 Mbytes of memory‡	●	Segments	●	●	○	●

*4,096 colors in color map mode. †Unlimited number of light sources in new release. ‡Storage capacity is expandable with removable 20-megabyte cartridges. \$199 forth in new release.



is an extremely simple method for controlling movement. Flexibility is important in this end of the program; this approach allows you greater flexibility than would the usual method, setting up a Y-rotation of 360 degrees over 30 frames. West End allows two forms of motion editing. You can work directly on the motion-scripting sheet or call on the text-editing function.

The text-editing function displays a spreadsheet, with motion commands in rows and time in columns. All of the movements for the animation scene are contained within one spreadsheet; each line represents a chosen movement from the beginning to the ending video frame.

The spreadsheet format is extremely helpful for setting up multiple movements on the same and different objects.

SPEED TAPERS West End can taper the speed of a movement—a unique feature. Without this ability, motion would appear mechanical and jerky. You can define tapers individually with every motion command you call. Tapering is effective when you are setting up any motion that requires a natural build-up of speed.

PictureMaker uses a motion-scripting sheet that is composed of separate motion scripts, each dedicated to one object. To see all of the motions together you must

choose the View All option from the Sequence Unit submenu. At this point you will have a script, called a Shoot Macro, that comprises all the objects for which you have previously scripted the motion. You then load the Shoot Macro into another submenu called the Click Unit. Here you will finally send images to tape: This process is as confusing as it sounds. PictureMaker's engineering orientation makes the interface to motion scripting secondary to object rendering.

Image-Maker sets up motion in a very graphic way. The first step in setting up an object's movement is to draw a *path line* on a graphic display of Z space. In es-

FONTS			OBJECT RENDERING					RASTER CAPABILITIES				MOTION SCRIPTING					CAMERA MOVEMENT		
No. of fonts	Anti-aliasing	Kerning	Beveling	Shading	Shading edges	Reflection	Texture mapping	No. of textures available	Transparency with textures	Paint program	Has video input	Maximum no. of objects	Tapers	Motion morphosis	Pans	Zooms	Tracks		
12	●	●	●	●	●	○	●	Chrome	3	●	●	64	●	●	●	●	●		
8	●	●	●	●	●	○	●	None	Unlimited	●	●	Limited by memory	●	●	○	○	○		
25	●	●	●	●	●	○	●	Aluminum Bronze Chrome Gold	Unlimited	●	●	Limited by memory	○	●	○	○	○		

● Yes ○ No

■ ANIMATION SYSTEMS

sence, you are looking down from above at a line representing the computer screen, a locator for the camera eye, and a line showing the maximum depth. You may then draw a connected line that traces the path of the object. The line may cross in and out of visibility or cross over the line representing the computer screen. If you cross the screen line, you will bring the object closer to the camera and increase its size.

Once you have defined Z space, you must apply X and Y coordinates. Again, a graphic display helps you decide on the path of movement. While this method is

■ With the West End Animation System you can bring your camera very far away from your scene, zoom in on it, or move around it.

extremely intuitive, the more-rigid method of entering key frames ultimately offers you more control when editing.

LIGHTING In all three systems, you can control lighting. Some products have more available "light sources" than others. Using more than one light source can add some dramatic effects. Generally, the color of a light source is pure white, but Image-Maker offers a colored light source as well. By defining a highlight as color rather than as white, you can simulate the effect of theatrical lighting with colored gels.

Each animation system gives you control over the position of the light source and its intensity. The Image-Maker system provides a graphic display of the light source position options, representing each choice as an icon. This particular approach is fast and simple.

West End also offers a graphic display for positioning a light source, but its display is very confusing. You'll find it much easier to skip the display and directly input

FROM COMPUTER TO TAPE

Once you've created and rendered your objects, painted your backgrounds, and scripted your motion, you need to make the jump from your AT to a videocassette recorder.

The most complex and confusing part of video animation involves getting a video signal from the computer and recording one frame at a time onto tape.

A color video signal, whether it comes from a video camera or a computer graphics card, starts out as three monochrome pictures, each representing the red, green, or blue portions of the image.

Although it is of very high quality, this format, called the RGB format, is unwieldy and difficult to transmit. Sending the signal requires four wires: one for each color and a fourth to synchronize the other three.

A device called an encoder combines these signals into one signal, known as NTSC (National Television Standard Code) composite video. Studio color cameras have encoders built into them, but most graphics cards do not. The RGB output therefore must be converted to NTSC using a commercially available encoder frame. Encoders are available through such companies as Lyon-Lamb, Lenco, and Bosch; the price range is from \$1,500 to \$5,000.

Not all computer graphics cards are capable of producing a signal that can be encoded. Signals from the EGA and CGA cards use TTL (also known as digital) rather than analog methods and are difficult to encode. The card's video signal must be formatted to conform to the RS-170 video standard.

RECORDING A FRAME Getting a composite NTSC signal is only half of the battle. To finish the job, you must

also be able to record that signal onto tape, one frame at a time. The very nature of video tape recorders makes recording just one frame quite difficult. Essentially, you must edit the tape while it is moving, using a video cassette recorder capable of insert editing, such as the Sony 5850.

This task also requires a single-frame controller, the device that links the computer with the VCR. These controls, made by companies such as BCD and Lyon-Lamb, range in price from \$3,000 to \$15,000. The controller assigns a number to each frame on the tape. The computer then instructs the controller to add a new frame at the number you request.

To add something at frame 500, for example, the controller will first rewind the tape back 150 frames and put the VCR in play. This essential step gives the tape 5 seconds to settle down before the actual edit. During these 5 seconds, the controller is constantly reading the frame number. When it reaches frame 500, it will ask the VCR to record one frame and then stop.

The process continues with each new frame until the sequence is complete. In spite of this fragmented creation process, the animation will move smoothly when you play back the tape at 30 frames per second.—Bill Ferster

Bill Ferster is president of West End Film, a manufacturer of PC-based computer graphics systems located in Washington, D.C.

the X, Y, and Z values.

The West End Animation System is the only one that allows movement of the camera. You may bring your camera very far away from your scene, zoom in on it, or move around it. Objects may be individ-

ually uncoupled from the effects of the camera movement; in other words, as the camera moves, the object appears to be fixed in front of it.

All three systems offer *metamorphosis*, a feature that allows you gradually to

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■ ANIMATION SYSTEMS

change one object into another across any given number of frames. For example, you could change the letter A into the letter C very smoothly.

PENCIL TEST Once you have created the motion script, you need to see if the movement is correct. Running each fully rendered frame to video tape is too time consuming; the same movement can be represented in wireframe mode in a fraction of the time. And if you only need to see the basic movement, you may choose to run a "pencil test," which will allow you to see every 5th, 10th, 20th, or whatever frame you desire played back in real time. The pencil test is stored as a file that you can cycle through quickly.

All three systems approach pencil-test creation differently. The West End Animation System limits you to 16 frames in a pencil test but allows you to create a rendered pencil test. PictureMaker imposes no official limit to the number of frames, but there is a practical limit: PictureMaker paints the wireframe image on the screen and then wipes it off to display the next frame. Once a point is used by one frame, it is no longer available to the frames that follow. Eventually, little or nothing will appear on screen as more and more points are used. Image-Maker lets you create a wireframe pencil test consisting of a squared number of frames, with a maximum of 64.

RECORDING Recording your script to video tape is the most time-consuming step in creating an animation. Image-Maker uses its second AT to create the display files for your animation. By communicating through the LANlink network, the system sets up the necessary files on the second AT, which then controls recording. This AT then acts as the production machine, allowing the first AT to continue to act as a creative workstation.

Image-Maker renders each frame and stores it as a file to be sent to video tape. This method uses up a large amount of memory. The system comes with a 20-megabyte Bemoulli Box. If your script requires more than 20-megabytes, Image-Maker will prompt you to load a new cartridge.

PictureMaker also creates a file for the

COMPUTER ANIMATION: GLOSSARY OF TERMS

Analog RGB The standard analog computer signal, sent out over four separate wires as red (R), green (G), blue (B), and sync.

Composite video The standard video signal. All display information is compiled for transmission across one wire.

Extrusion The process of pulling a 2-D object into three-dimensional space to create a 3-D object. The extrusion process replicates the vector points of a 2-D object and places them closer or farther away on the Z axis according to the desired depth.

Flat shading A rendering technique that shades the polygons that make up a 3-D object and yet leaves intentionally flat surfaces filled with a solid color.

Ray tracing A rendering technique used to show reflective surfaces.

Rotation Another method for creating a 3-D solid. The rotation process replicates the vector points of a 2-D shape any number of times around a specified Y axis.

An example of a rotated solid is a sphere created from an arc.

Smooth shading A rendering technique that fills each polygon with shades of a chosen color, blending each into the color of the adjoining polygon.

Specular highlighting The simulation of light on a shiny surface. You obtain this effect by painting your brightest color onto the polygon at zero angle to the light source.

Vector A point-to-point instruction. Rendering a square with vectors requires only four point instructions; a cube requires eight.

Wireframe A display method used to save time in rendering an object or scene. The object is shown as its vector points, connected by lines.

Z axis This axis conveys depth. Whereas the X axis refers to the space from left to right, and the Y axis refers to the space from top to bottom, the Z axis refers to the space from front to back.

images, and again storage is the primary issue. You will need lots of it. Cubicomp offers a solution: its PictureMaker/20 system, priced at \$36,500, will do the modeling and rendering.

The most cost-effective system for getting your images onto video tape is offered by West End. As you create and render images, they are recorded immediately. The program creates no additional files after you have created your script file. While the system is not tied down by creating more files, it is kept occupied for the duration of the recording. Most computer animators overcome this problem by scheduling the taping to run overnight. Once you have set up the system to run to video tape, you can leave it alone.

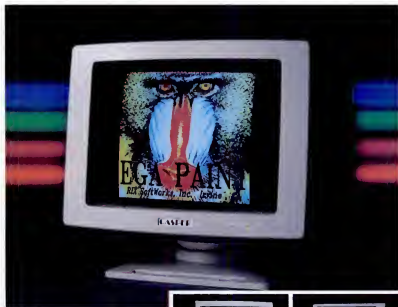
A corporation that relies on animations will quickly reap the benefits of a PC-

based system. If your company has never used animation because of the cost or the effort, one of these three systems may give you the incentive to try it. To amortize the initial investment, many smaller corporations are setting up subsidiaries to run their video systems. The offspring company may then take on other clients and compete in the video marketplace.

The real rewards of video animation come from the presentation impact. Company logos look more impressive when they zoom into place. Presentations generally do a better job of conveying a message when they keep the viewer interested. ■

Gerard Kunkel is graphics editor and technical art director of PC Magazine. G. Heather Luchak is a free-lance writer based in New York City.

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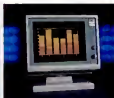
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NEW PLOTTERS: ALL THE WAY FROM A to E, PART 2

The large D-size and E-size plotters occupy the higher end of the plotter marketplace's two distinct segments. Unlike the lower-end A, B, and C plotters reviewed in Part 1 of this two-part series, these tools are targeted for architects and engineers. While the smaller plotters are designed for desktop use, most D and E plotters are upright units mounted on waist-high stands, though several can be used on tabletops. Maximum allowable media size for these high-end devices is also much larger. Desktop plotters accommodate media ranging from 8½ by 11 to 17 by 22 inches. D and E plotters extend the maximum allowable media size to 24 by 36 and 36 by 48 inches respectively.

The applications for which high-end plotters are intended are quite different from those for smaller plotters. While desktop plotters are becoming

standard tools in working environments that produce quantities of business graphics—charts, graphs, maps, overhead transparencies, and other visual aids—D- and E-size plotters have long been standard tools in commercial offices that require large-format schematic output like architectural plans, engineering schematics, product designs, and even printed circuit boards.

Previously, such output was produced using software that ran only on mainframes and minicomputers. The increasing abilities of the PC and the introduction of CAD software for personal computers have altered the old order. Large-format plotters don't care where their instructions come from. More and more frequently, they come from PCs.

As D- and E-size plotter manufacturers have been drawn into the PC marketplace, their prices have tum-



Giant D- and E-size plotters are the workhorses of computer-aided design applications like architecture and engineering. Also reviewed: printers that pitch themselves as plotter alternatives.

■ NEW PLOTTERS

bled. Not so long ago, you couldn't look at an E-size plotter for under \$15,000. Three of the four E-size plotters reviewed here list for under \$10,000, and one of these, the Enter SPI 200, lists for less than \$5,000.

Another interesting and perhaps significant phenomenon has recently gathered force: the positioning of certain printers as plotter alternatives. In addition to the new D and E plotters examined here, this article reviews two laser printers and a color-dot-matrix printer whose manufacturers have emphasized their plotterlike capabilities in advertising and promotion. These printers are just representative samples; almost any dot matrix printer with graphics capabilities can be used in a similar way.

If you need more background on plotters in general or wish to review the PC Magazine Labs testing methodology for plotters, refer to "New Plotters: All the Way from A to E, Part 1" (*PC Magazine*, Volume 5 Number 17). For reviews of two E-size plotters and more information on computer-aided design, see "CAD: The Big Picture for Micros" (*PC Magazine*, Volume 5 Number 5). Large-format plotters are bigger and generally more expensive than their desktop cousins, but this appraisal of their value is based on the same criteria: quality of output, time required for execution of a standard plot, durability, flexibility, overall design considerations, and comparative price.

Mural

The Mural plotter is a large flatbed unit capable of producing D-size drawings. You can use it horizontally on a large table surface, but you can also hang it on a wall to save a considerable amount of room. Two



The low-priced Mural from United Innovations Crossroads proves that you get what you pay for. It offers adequate performance at an extremely competitive price but lacks the perks of more-expensive products. Its manual needs improvement, its media hold-down system is inconvenient, and its HPGL emulation contains small flaws. The plotter produces fair-quality output in strictly average times—which, at \$2,495, may suit your needs just fine.



standoffs (actually hardware-store door protectors) screw into the base of the plotter so that one edge is raised away from either the wall or the table surface.

Fourteen DIP switches configure the Mural's bit-per-second rate, interface handshaking, and other operating characteristics. Only an RS-232 serial interface is available, but it is very standard and easy to connect. Several mechanical adjustments, such as pen pressure and pen height, can be made but aren't often necessary.

The Mural has no operator panel as such. Other than the power and DIP switches, all controls reside on a hand-held controller that connects to the plotter with a coiled cord. It's actually a sturdy Wico video game controller with 13 keys and a

joystick. Since it uses the nine-pin connector standard on Atari-type video games, extension cables should be readily available. Joysticks are often included with expensive, large plotters because they make it easy to locate the printhead or to digitize points; using a game controller for this purpose works quite well on the Mural.

The Mural's command language is essentially HPGL compatible. The closest Hewlett-Packard equivalent is the 7475A, a B-size plotter. The problem is that many software programs won't produce a plot any larger than B size if configured for a 7475A. The Mural has a switch that doubles its step size, which creates a D-size drawing from B-size instructions, but this switch merely creates a larger drawing with halved resolution. However, since



FACT FILE

Mural

United Innovations Crossroads
Crossroads Industrial Pk.
Holyoke, MA 01040
(413) 534-4400

List Price: \$2,495

In Short: A D-size flatbed plotter that offers good compromises and fine value at its low cost.

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PLOTTER ALTERNATIVES: NOBODY DOES IT BETTER . . . SO FAR

As printing technologies get slicker, marketers have begun to promote printers for graphics applications. But prices will have to tumble and performance climb before printers can contend for the professional market.

Throughout the decades of computer development, plotters were considered the best—and for a long time the only—method of producing high-quality graphics hard copy. While plotters still top the list in the minds of users who rely on them, alternative technologies that also generate graphics output are making a bid to share the graphics-output market.

The challengers include technologies that have been around for quite a while as well as innovative techniques. Historically, the output quality from more-familiar alternatives could not match that from high-resolution plotters, but now both evolutionary improvements and revolutionary advances have brought plotter alternatives to the point where they may be practical for certain applications.

DOT MATRIX AND LASER One such alternative is the dot matrix printer. Many of these workhorses of the personal computer office environment have always offered graphics modes, which may be sufficient for screen dumps and other noncritical applications but are not up to professional quality demands. Newer models, however, use 24 pins in their printheads instead of 9; this advance can improve resolution by reducing the size of each dot. In addition, better positioning techniques have improved the accuracy of dot matrix graphics output. Some units can produce color graphics by using multicolored ribbons and multiple passes of the printhead.

The JDL 750e printer is an excellent example of a color printer designed specifically for graphics use in CAD and business graphics systems. Many other units are available, including the Fujitsu DL 2400 and 2600 24-pin printers, which can even make color overhead transparencies with a special ribbon, and Epson's new 9-pin EX-800 and EX-1000 with its low-cost color option.

Laser printers have revolutionized office printing with their high-quality output, font flexibility, and quiet operation. Since laser printers are basically advanced dot matrix devices with a large number of very small and accurately positioned dots, they're intrinsically capable of graphics output. However, they must store an entire image internally before printing a page; thus the amount of memory necessary to store all the dots that comprise a complex graphics image is quite large. The less-expensive laser printers either can't handle graphics or else severely restrict the size of the image created. As memory prices drop, look for new low-cost laser printers with full-page graphics capability.

Laser printers can now print only in black and white, and they're limited to 8½- by 11- or 14-inch paper. Rumors that color laser printers will appear before the end of the year haven't yet proven true, and, in any case, the initial "low-cost" color lasers may cost \$25,000. But the inevitable price declines over time may make color laser printers the graphics devices of the future.

SPRAY-ON AND IRON-ON Ink jet printers, another alternative, create tiny droplets of ink and direct them onto the paper. Various techniques are used to generate and control the droplets, but the net effect is yet another variant of dot matrix printing. Although some ink jet units have been prone to troublesome clogging and many require special paper to avoid blurring, ink jet technology can produce very good graphics images when everything goes well. Low-cost units from Diablo, Canon, and others are readily available.

Less-common alternatives to traditional plotters include thermal-transfer printing, which transfers colored substances onto the paper by melting—a process almost like that used for iron-on decals for T-shirts—and electrostatic plotter/printers, which create graphics on special coated paper by removing unwanted portions of the coating.

In this second part of our new-plotter survey, we also review a dot matrix printer, the JDL 750e, that is being marketed as a plotter alternative, and a couple of laser printers to give you some idea of the trade-offs involved between these technologies and plotters. The alternative methods are improving every day, and some of them can easily serve nongraphics applications as well. This flexibility is one of the biggest pluses of the plotter alternatives, but the beautiful and near-perfect drawings that the better plotters can produce are still hard to match.

—Glenn Hart

the Mural's step size is relatively coarse, the resolution difference won't be significant or even noticeable.

There is no media hold-down system per se. The medium is fastened to the Mu-

ral's plot bed with masking tape circles made expressly for this purpose. Aligning the medium exactly isn't too difficult if the Mural is horizontal, but it's a bit of a task when the plotter is hung on a wall. You

also have to be careful when removing the finished plot, lest the tape circles tear the medium. As with all flatbed plotters, the Mural can plot on pretty much any medium, while roller-bed and drum units re-

■ NEW PLOTTERS

quire the use of thin media.

The Mural's manual is inadequate, with no mention of what pen types or colors are available and no specifications. There's enough information to get you going, but barely. It turns out that the Mural can use the standard Hewlett-Packard pens used in the 7475A and similar units, which makes a reasonably wide choice available.

The Mural's performance on PC Magazine Labs initial tests was only fair. Its plot times were definitely on the stately side, but more important, its accuracy and overall plot quality were mediocre. Diagonal lines weren't bad, but closely spaced vertical lines (as in area filling) were noticeably uneven. The internal character font was acceptable.

When I informed United Innovations Crossroads of these findings, staff members said they were aware of some situations where the plotter could step to one side in long lines. Although they claimed that none of their customers had complained, within half a day they called to report that they had changed the plotter's math algorithms and were sending a new set of ROMs. When I retested the Mural, its plot quality was much improved, without the unevenness on straight lines. Plot times were the same. All production will now use the improved ROMs.


At \$2,495, the Mural is low priced for a D-size plotter, and it's built rather sturdily. It's slower than many (but not all) competitive plotters, and the plot quality still isn't up to that of more-expensive units. But with the improved ROM, the Mural is quite competent for many applications.

Numonics 5460

Numonics is a firm specializing in CAD peripherals. I've had good experience with this company's digitizing tablets, but testing the Numonics 5460 D-size plotter was my first exposure to its plotter line.

The 5460 is a drum plotter and smaller than many D plotters, but it is quite heavy and solidly built for its size. While the plotter is nicely styled, the metal in the area over which the medium moves looks rather unfinished and a little inexpensive. The optional floor stand is simple but sturdy.

Pinch-wheel/grii-rollers, in conjunction with a vacuum mechanism, hold the medium secure and flat in the critical plotting



FACT FILE

Numonics 5460
 Numonics
 418 Pierce St
 Lansdale, PA 19446-2498
 (215) 362-2766
 List Price: \$2,975

In Short: A compact, D-size, single-pen plotter whose performance is only moderately good.

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area. As on many similarly designed plotters, the 5460's rollers are essentially fixed in position (the right roller can move a couple of inches to accommodate architectural

al, engineering, and ISO media variants) and allow only C or D plots, depending on whether you insert the short or long edge of the medium. Numonics offers an adapter that lets you use A- or B-size media as well.

HPGL is the 5460's resident graphics language. The 5460 emulates HP's 7580 and should run with almost any business graphics or CAD software. Numonics lists a dozen HPGL commands that aren't implemented in the 5460, but I had no problem running the tests. I wouldn't be surprised if many competitive HPGL emulations aren't totally complete either. Numonics is just more candid and informative than most manufacturers.

Eight DIP switches set the RS-232 op-

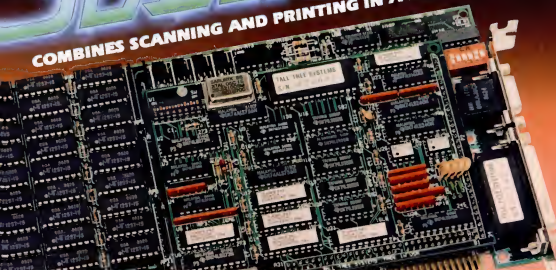


The Numonics 5460 lacks the polish of a truly great plotter. This moderately priced, solidly built plotter offers good HPGL emulation, secure media hold-down, and an informative manual. However, it requires an adapter to produce A- or B-size plots, the pen-pressure controller is manual, and plotting time was slow for plots of only average quality.



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erating parameters. The manual discusses the interface but doesn't include a diagram of the appropriate cabling. However, I had no trouble constructing one; the interface is quite normal. Two helpful LEDs, wired to the transmission and reception lines, confirm correct connection.

Fiber-tip, ballpoint, ceramic, and liquid-ink pens are available. Numonics uses Western Graphtec pens, which improves the selection. A thumbwheel adjusts the 5460's pen pressure, which you must determine empirically. There is no automatic pen-type sensing, but at least the adjustment is possible.

The operator panel has nine buttons to control paper and pen movement. A mechanical lever raises or lowers the pinch wheels to let you insert and remove the medium. It's not the most elegant technique, but it's serviceable.

The 5460 is not a speed demon. Its timing on the ROM-font test was one of the slowest I have tested to date. The software font was a bit more in line with the slower competitive plotters. On the test charts, the 5460 displayed adequate but not inspired quality. Diagonals were fair to good. The ROM font was acceptable but not the most attractive tested.

I liked the look, feel, and compact size of the 5460, and its price is certainly not out of line for a D-size plotter. But though it has some advantages and disadvantages compared with other low-end D plotters, overall it doesn't offer either high speed or first-rate plot quality.

Draftpro 7570

Hewlett-Packard is considered by many to be the industry leader in both desktop and large CAD plotters. Its plotters have never



Although it lacks a few luxuries, Hewlett-Packard's Draftpro 7570 is appealing enough to rank as an Editor's Choice. Competitively priced for a high-end plotter, the Draftpro is packed with features. It is equipped with twin eight-pen carousels and stocked with a wide selection of pen tips, widths, and colors. But its true strength resides in its combination of good plotting speed with Hewlett-Packard's traditional superb output quality and snappy visual appeal.



been the least expensive in their classes but have always offered excellent performance.

Many competitors have been chipping away at Hewlett-Packard's share, especially in the microcomputer CAD market, where the company's D- and E-size entries have been relatively costly. Now HP has addressed this promising market segment with its new Draftpro 7570 D-size eight-pen plotter. It's built in the HP tradition and offers fine performance at a very aggressive price.

The Draftpro's massive eight-pen carousels are solidly built. It has two carousels, one for fiber-tip pens and one for drafting pens. The standard, short-body HP fiber-tip pens used in HP's desktop plotters fit the fiber carousel. HP has intro-

duced an extensive line of its own disposable liquid-ink pens, including four tip widths in eight colors. HP has also announced disposable liquid-ink pens with tungsten tips suitable for mylar film, an industry first as far as I know. Until now, film users had to deal with the messy liquid-ink pens that use a traditional reservoir.

Acceptable media include paper, vellum, or double-matte polyester film. Only C- and D-size media can be used; there are no provisions for A- or B-size plots.

The Draftpro uses a mechanical pinch-wheel/grit-roller system to hold the medium. There's no indication that it uses a vacuum system, although there appear to be air holes in the area where a vacuum would normally be applied. The plotter has

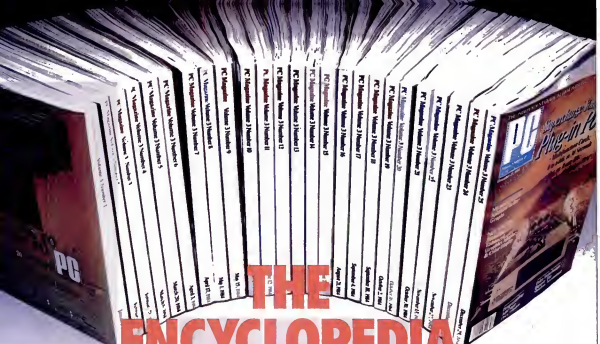


FACT FILE

Draftpro 7570
Hewlett-Packard
16399 W. Bernardo Dr.
San Diego, CA 92127-1899
(619) 482-4100
List Price: \$5,400

In Short: An aggressively priced, top-quality D-size plotter from industry leader Hewlett-Packard.

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■ NEW PLOTTERS

two mechanical sensor arms that automatically sense the length of the medium inserted.

The 22-button operator panel includes buttons for selecting individual pens and all the normal panel functions. The pen speed can be specified from the panel in 5-centimeter-per-second increments, from 5 to 40 cm/s. An interesting Axis-Align feature lets you align the plotting axes to grid lines on preprinted media. This feature is not comparable to the more sophisticated

■ The test plots had the snap and appearance characteristic of HP plotters and pens.

automatic feature incorporated into the Calcomp 1043 or Western Graphtec GD9011 (see review), which reorients the entire plot to the edges of the medium to compensate for medium skew, but it could be useful in special situations.

A serial interface is standard on the Draftpro. Hewlett-Packard's HP-IB (IEEE-488) interface is available as an option on a plug-in cartridge. The serial interface on the test unit was normal and easy to connect. A 12-position DIP switch sets bit-per-second rate and parity. One switch expands the usable drawing area by reducing the automatic margins at the edges of the medium. Another enables the Pen Sort feature, a simple form of optimization that looks ahead in the plotter's buffer and groups drawing instructions using the same pens to reduce the number of pen changes required.

HP's standard fiber-tip pens are among the best in the industry, and they worked perfectly in the Draftpro. The test plots had the snap and appearance characteristic of HP plotters and pens. At the highest pen speed of 40 cm/s, diagonal lines were very good, although not perfect. Backing off a bit in pen speed improved quality still further. The Draftpro isn't the fastest large plotter, but its plot times were quite good.

I also tested HP's disposable liquid-ink

PC LABS: BENCHMARK-TESTING PLOTTER SPEED

Throughput time is an essential consideration when choosing a plotter or plotter alternative.

Probably the most important single issue to consider in choosing a plotter is the visual quality of the finished plot. A plotter's output quality stems from a combination of many mechanical factors in its design, such as plotting speed, pen design, media type, and repeatability. To let you judge the quality of plotter output for yourself, we've published magnified segments of our test charts and text (see sidebar, "Clocking the High-Speed Modems.")

It's easy to time any group of products if the circumstances are made identical for each item. To maintain consistency, we replicated the setup that we used to evaluate 24 plotters last December, running the same IBM PC—equipped with 640K RAM and a dual 10-megabyte Bernoulli Box—at the standard 4.77-MHz clock rate. Once again, we chose KeyChart business graphics software by Softkey Software Products and used it to generate the same test chart—which contains plenty of text and those nasty diagonals that often cause plotters to stumble.

KeyChart lets you choose between the internal character set stored in a plotter's ROM or the more complex, multistroke text fonts created by the software. ROM fonts are always faster than complicated software fonts because fewer instructions are necessary to draw each letter. Of course, a ROM font is immutable—whether you like the design or not, you can't change it—while software can generate a wide variety of type styles. The ROM fonts in the plotters tested varied from downright ugly to reasonably attractive. To help you compare the plotters and decide whether the trade-off between plot time and text quality is important to you, we timed each plotter using both ROM and software fonts and commented on the appearance of the ROM font.

For consistency, we also operated the plotters using serial ports at the same 2,400-bits-per-second rate used in our earlier tests. Since some small plotters can't accept data at a faster rate, this lets you compare all the plotters directly. In the real world, though, you would run your plotter at the fastest rate your hardware and software could support.

Perhaps surprisingly, the faster transmission doesn't matter all that much with many plotters, because their mechanical limits are such that they rarely, if ever, wait for data from the computer. Some of the larger, faster, and more expensive plotters run noticeably faster with higher serial data rates, however, and the ones that are equipped with parallel ports can offer both faster plotting and easier connection. Since the differences are greater with the software font tests, the ROM-font comparisons are perhaps more revealing of the true differences between units. In any case, while our benchmarks are accurate for the purpose of comparing one plotter to another, they aren't meant to show exactly how long a given plotter might take to plot our test chart in your office.

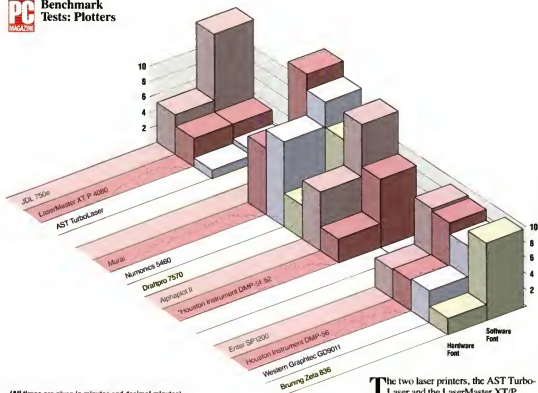
We used the pens and media that the manufacturer supplied with each plotter, since they can affect the appearance of the finished charts. While pens came with each device, a couple of manufacturers didn't supply paper samples. In these cases we used a standard plotter paper sold by a popular computer supply company, reasoning that this is what is available to most users.

The result is that we maintained comparability with last year's tests in all respects. The performance of a single D-size plotter we reviewed last year, the Houston Instrument DMP-51/52, is included for your convenience.

—Glenn Hart



Benchmark Tests: Plotters



(All times are given in minutes and decimal minutes)

	Type	Hardware Font	Software Font
JDL 750e	Dot matrix	4.35	12.35
LaserMaster XT/P 4080	Laser	2.97	2.97
AST TurboLaser	Laser	0.48	1.18
Mural	D	7.63	15.00
Numonics 5460	D	9.78	13.17
Draftpro 7570	D	3.53	10.02
Alphaplot II	D	8.53	13.45
Houston Instrument DMP-51/52	D	2.43	8.38
Enter SP 1200	E	3.13	9.08
Houston Instrument DMP-56	E	3.33	8.88
Western Graphictec GD9011	E	3.73	7.65
Bruning Zeta 836	E	1.95	9.40

*The Houston Instrument DMP-51/52 was originally tested in Volume 4 Number 26.

The two laser printers, the AST TurboLaser and the LaserMaster XT/P 4080, dominated the benchmark speed tests; the TurboLaser finished in one-fourth the time of any other machine. The Bruning Zeta 836 and Western Graphictec GD9011 led the rest in the hardware and software tests, respectively. Our two Editor's Choices, Hewlett-Packard's Draftpro 7570 and the Houston Instrument DMP-56, held their ground in the middle of the pack. United Innovations Crossroads' Mural and the Numonics 5460 brought up the rear.

In comparison with previous plotters, this group was especially fast. For example, the two Editor's Choices, which turned in average times for this bunch, would have placed in the upper fourth in last issue's review of A, B, and C plotters.

■ NEW PLOTTERS

pens, which drew superb lines. Diagonal lines and accuracy at the half-speed setting recommended for these pens were perfect. Like all disposable liquid-ink pens, they work best on vellum rather than paper, because their sharp points can be clogged by fibers scraped off the paper (although I made a dozen consecutive large plots with AutoCAD on paper with absolutely no problems).

I was very impressed with the overall quality of the Draftpro. While it lacks a few of the bells and whistles that competitive units (and HP's much more expensive plotters) offer, I think the trade-offs chosen by HP's engineers are well reasoned. HP quality and performance, eight-pen capacity, and solid construction in a \$5,400 package is a good deal, and I forecast great success in the marketplace for this plotter.

Alphaplot II

Like all large flatbed plotters, the six-pen Alphaplot II can plot on media other than standard paper or film. Alphameric Corp. cited some esoteric uses for its plotter, such as drawing prototype circuit boards directly using special pens.

The Alphaplot is intended for horizontal operation, but a wall-mount kit allows you to hang the device to save work space. The medium is held to the magnetized flatbed with magnetic strips.

The Alphaplot uses HPGL and emulates the Hewlett-Packard 7580. Since many microcomputer software programs support only HP's smaller plotters, an interesting Alphaplot option can zoom A- or B-size images to C or D size automatically, an innovative feature that could be quite useful for making large charts from

software supporting the HP 7470 or 7475A desktop plotters.

An optional digitizing kit (\$405) consists of a joystick controller and a digitizing cross-hair projector with its own power supply. The Alphaplot has two digitizing modes: a normal point-entry mode and an unusual screen mode, in which the plotter emulates a digitizing tablet for drawing. Using the Alphaplot this way might not be convenient, but it's an interesting option.

Since it can use pens designed for the HP 7580 and HP 7475A, the Alphaplot offers users a wide range of pen options. As if this weren't enough, you can even use Pilot and various other pens with special pen holders.

A 16-button control panel executes all

the normal commands to move the pen head, raise and lower the pen, and set scaling and rotation. Special key sequences adjust pen speed in ten increments from .5 to 10 inches per second, enable digitizing mode or the pen changer, and perform other adjustments.

Connecting the Alphaplot is straightforward; the RS-232 serial interface is quite standard, and eight DIP switches configure the interface easily. The documentation is clear enough on installation but, as Alphameric admits, is sadly out of date in several other respects.

On the first benchmark tests, the Alphaplot proved rather finicky in operation. The pen cart has an adjustment for pen height that proved to be critical—just a lit-

Alphameric's Alphaplot II suffers from a host of problems. A finicky pen cart requires you to adjust pens manually to the perfect height. Too low and the pen will scar the paper; too high and no plot will be produced. Once the pens are adjusted, the machine neither plots quickly nor produces particularly attractive plots. Moreover, its documentation is out-of-date, its magnetic-strip hold-down method is inconvenient, and it has no automatic capping procedure.



FACT FILE

Alphaplot II

Alphameric Corp.
8031 Remmet Ave.
Canoga Park, CA
(818) 999-5580
List Price: \$5,990

In Short: Disappointing performance and finicky operation mar this D-size flatbed plotter by Alphameric.

CIRCLE 662 ON READER SERVICE CARD



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■ NEW PLOTTERS

tle too high and the pens leave gaps on some parts of the chart (I suspect that the plot bed may not have been absolutely consistent across its surface), just a little too low and the plots are scarred as the pens move unforgettingly over the surface. The magnetic-strip hold-down system didn't help solve this problem. As with other such systems, it sometimes proved difficult to get the medium to lie exactly flat. Electrostatic hold-down systems are far more desirable.

After many ruined plots, I finally got the adjustments almost right. Even then, the minor differences between individual pens would occasionally cause a gap or a pen scar. Unfortunately, I'm not sure all the effort was worthwhile. The Alphaplot is not especially fast: the ROM-font test took 6½ minutes and the software font test 13½. Neither are its plots particularly good: diagonal lines are far from perfect and overall accuracy is not equal to the best.

The Alphaplot gave me more trouble than any other device in this review project. The plotter is nicely constructed, but the supercritical pen adjustment, relatively slow plotting speed, marginal plot quality, and lack of pen capping render it unappealing, especially when compared with competitive plotters that offer more pens and faster and more-accurate plotting at equal or lower cost.

Enter SP1200

The Enter SP1200 is the first large plotter from Enter Computer, a firm best known for its Sweet-P line of desktop plotters. The SP1200 is virtually identical to the Ioline LP3700 Plotter tested by PC Magazine Labs earlier this year (see "Hardware: Firm Support for CAD," *PC Magazine*, Volume 5 Number 5).

The SP1200, like its Ioline cousin, is an E-size single-pen plotter whose main claim to fame is its retail price of under \$5,000. This is a remarkable cost for a unit capable of producing the large plots needed by architects and others. Its closest rival is the \$6,000 Houston Instrument DMP-56 (see review).

The SP1200 resembles the Houston Instrument DMP-56 in more than price. Both are wide devices that sit on vertical stands, and their operating principles are



The Enter SP1200 combines an extremely low price and high plotting speeds in an attractive package that suffers from its only-average plot quality. Although its orthogonal accuracy was good and overall appearance was adequate, the diagonals wavered unduly. The SP1200 does not come with HPGL emulation, but instead uses the DMPL graphics language. An extremely wide selection of pens is compatible with this plotter, which is equipped to use roll paper. A combination of rollers and a vacuum hold the medium securely flat.

similar. Both use the DMPL graphics language.

Revolving capstans hold the medium against a rotating grit wheel. A vacuum is applied to the underside of the medium to hold it flat in the critical plotting area. You can position both rollers at any point along their support rail, which lets you plot on almost any size medium up to the full width. The SP1200 plots on single sheets, but roll paper can be stored on a crossbar on the stand. Enter supplies a special cutter that fits in a horizontal groove to make slicing off a length of roll paper convenient. The SP1200 can use Staedtler or Hewlett-Packard-compatible liquid-ink, disposable fiber-tip, or roller-ball pens.

A membrane keyboard with 24 "but-

tons" controls all aspects of the plotter's operation, including interface parameters. The SP1200 has no nonvolatile RAM to remember your settings, and so if you use



FACT FILE

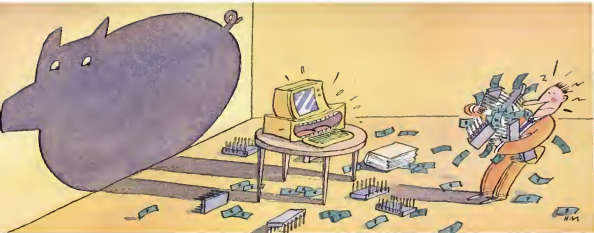
Enter SP1200

Enter Computer Inc.
6867 Nancy Ridge Dr.
San Diego, CA 92121
(619) 450-0601

List Price: \$4,995 (plotter stand, \$250)

In Short: A fast E-size plotter at low cost, but with only fair plot quality.

CIRCLE #81 ON READER SERVICE CARD



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Unless you know all about .PIF files, interrupt vector swaps and the like, you won't exactly breeze through the set-up procedures for TopView and Windows. Not like DoubleDOS. Just tell it how to divide your memory, and that's it. You're ready to load and run your software right from that familiar DOS prompt.

Say you've started a sort routine in dBASE. Instead of waiting for it to finish, just press "Alt-Esc." Your dBASE screen instantly disappears, and up comes another DOS prompt. Simply load another program and go to work. Meanwhile, dBASE crunches away off-screen.

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■ NEW PLOTTERS

anything other than the defaults, you must reenter your choices each time you turn on the plotter. Various controls move the pen head manually in eight directions at three speeds and report the current head position to the host computer for digitizing, for example.

The test unit was equipped with an optional "HyperBuffer" that adds 512K bytes of RAM to store incoming plotting instructions and optimizes pen head movement by looking ahead in the stored-instruction stream to group instructions for a given pen or for an area of the image. This option can reduce plot time and return control of the computer to you sooner.

Enter specifies the SP1200's resolution as .0025 inch, which is obviously not as precise as plotters rated at .001. Speed is 14 inches per second when plotting on the diagonal, which is faster than some of the other relatively low-cost large plotters tested but well under the speeds attained by more costly devices.

Nevertheless, the SP1200's throughput in the benchmark tests was very good. Since it isn't possible to disable the internal buffer and optimization system, I can't say what contribution this option made to the good timings.

Unfortunately, and not surprisingly, the SP1200 exhibited the same problems with diagonal-line accuracy that I experienced with the Ioline 3700. Orthogonal accuracy is quite good, though, and overall plot appearance is not bad.

The SP1200's \$4,995 price is attractive, but the \$1,000 cost of the buffer seems a bit high for 512K on today's market. Though I'd like to see better plot quality, Enter's first entry into the large plotter market can claim to be one of the least expensive E-size plotters available.

Houston Instrument DMP-56

E-size plotters once cost well over \$10,000, but in the last year several units from Calcomp, Ioline, Enter, and now Houston Instrument have broken this barrier. Architects and others requiring big images can now obtain them at a reasonable cost.

The new single-pen, drum-type Houston Instrument DMP-56 is not the least ex-



The Houston Instrument DMP-56 earns an Editor's Choice by offering an excellent compromise between features and value. This low-cost machine produces first-rate plots in better-than-average times. The DMP-56 plots on A- through E-size media. A combination of pinch-roller and vacuum hold-down systems keeps the medium flat and secure. Although highly programmable, the DMP-56 bypasses the complications of DIP switches by using a deceptively simple internal menu system.

pensive E-size device available now, but it's the first offering in this size and price bracket from this old-line company. The DMP-56 is derived from and similar to the

D-size DMP-51/52 PC Magazine Labs tested (and designated an Editor's Choice) last year (see "Adding a Touch of Color: 24 Plotters, \$399 to \$5,950," PC Magazine, Volume 4 Number 26).

The DMP-51/52 produced only C- and D-size plots. The DMP-56 is much more flexible: you can move the left pinch roller to any of 11 positions to accommodate media from A (8½ by 11 inches) through full architectural E (36- by 48-inch) size. A threaded hole with a sensor is located at each position, so that the plotter knows the medium size in use. Vacuum hold-down is used in addition to the pinch-roller mechanism to ensure medium flatness in the critical area where actual plotting takes place.

The DMP-56 is highly programmable. A clever internal menu system plots each

	<h2>FACT FILE</h2>
<p>Houston Instrument DMP-56 Houston Instrument 8500 Cameron Rd. Austin, TX 78753 (800) 531-5205 (512) 835-0900 List Price: \$5,995</p>	
<p>In Short: A solidly built, fast, single-pen E-size plotter with excellent output quality and a reasonable price.</p>	
<p><small>CIRCLE 66 ON READER SERVICE CARD</small></p>	

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■ NEW PLOTTERS

■ The GD9011's rotating pen turret is unusually sturdy and caps the pens when they're not in use.

option (a long list including pen speed and acceleration, default paper size, character set, text font, and much more) and the allowable values. You move the printhead with the control panel's cursor keys to make your selections. Your settings are stored in nonvolatile RAM so that they become, in effect, the plotter's defaults. No DIP switches are needed with this simple yet sophisticated configuration method.

Pen types available include stainless-steel drafting, disposable drafting, tungsten tip drafting, and water-based hard-nib types. Various widths and colors are available, as are both fast- and slow-drying liquid inks.

A comparison of specifications with the DMP-51/52 is revealing. The specs for step size are identical at .001 inch, but pen speed has been reduced by some 30 percent. The slower speed presumably serves to maintain plot quality over the much larger medium area the DMP-56 has to traverse. Accuracy is specified at .2 percent, compared with .1 percent for the smaller unit, again a factor of the larger distances involved.

Real-world plotting quality doesn't suffer at all. The DMP-56's test charts were first rate—sharp and accurate. Much of the credit must go to the disposable liquid-ink pens supplied with the plotter. These pens draw a more precise line than fiber-tip pens without any of the mess of traditional fillable-ink-well liquid-ink pens. The internal fonts are unusually attractive. Plot speed was slower than for the smaller DMP-51/52, but quicker than that of many other units tested. I also tested the DMP-56 by having it draw several large-size plots using AutoCAD, and the results were fine.

Here and in the past, PC Magazine Labs tests of relatively low-cost E-size plotters have revealed compromises be-

tween large-image quality and price. The tight mechanical tolerances and precise pen-head control needed for accurate plots is far more difficult to maintain over large media without incurring significant cost penalties. I like the trade-offs the designers of the DMP-56 have made: this plotter isn't quite as fast as more costly devices and it is, of course, a single-pen plotter, but it produces lovely E-size images at a price I consider a very good value.

Western Graphtec GD9011

The Western Graphtec GD9011, a new four-pen plotter from Western Graphtec, offers an extensive array of features at a

competitive price. I was impressed with the GD9011's construction as two of us in the PC Magazine Labs manhandled it out of its huge shipping crate, and the positive reactions continued as our tests of the unit proceeded.

The GD9011's rotating pen turret is unusually sturdy and caps the pens when they're not in use. The GD9011 accommodates only four pens, rather than the eight often available in multipen E-size units. This is clearly a limitation, although four pens are probably adequate for most plotting tasks. An automatic-pen-type sensing mechanism adjusts the pen pressure and speed, and a soft landing system prolongs pen life.

A 40-character alphanumeric LCD



The Western Graphtec GD9011, a huge monster of a machine, produces superb plots in top-drawer times. A plethora of features make the GD9011 a delight to use. An automatic pen sensor determines optimum pen speed and pressure. The machine automatically adjusts for media skew by keeping the plot parallel to the edges of the media. The excellent control panel comes complete with an LCD screen that displays operations messages. Just one serious omission flaws the GD9011: it holds only four pens instead of eight.

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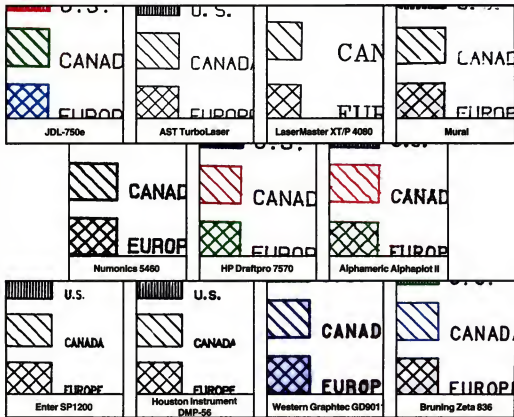
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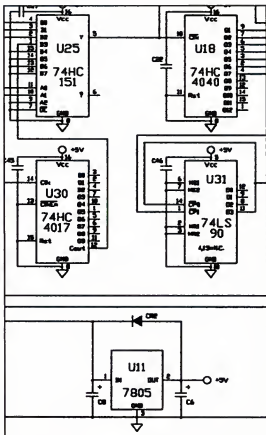
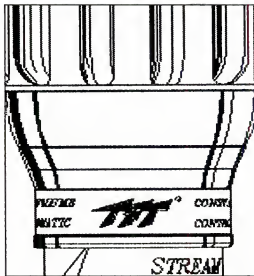
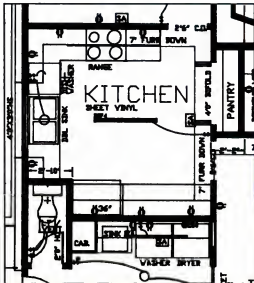
PLOTTER OUTPUT: FILLING IN THE STORY



The appeal and quality of a plot ultimately determines the desirability of the plotter. Representative output from each of the reviewed plotters is reproduced here.

Each sample contains a fill, a diagonal line pattern, a cross-hatch pattern, and text. The diagonal and the cross-hatch must accurately test a plotter's capabilities because the plotter must coordinate the motions of its vertical and horizontal motors: Shaky lines characterize cheaper machines with average quality. The completeness of the fill says more about pen width than about machine quality; to keep the benchmark-test results comparable, the software was not adjusted to account for differences in pen width, and plots made with wider pen tips show more complete fill than those made with narrow pen tips.

The two Editor's Choices, the D-size Draftpro 7570 and the E-size Houston Instrument DMP-56, yielded first-rate results, with the slightest bend to the diagonals and only slight bleeding at the corners. The plots of the Alphaplot II suffer from severe diagonal line wriggle; the faint scar marring the fill pattern resulted from the finicky pen-height adjustment. The AST TurboLaser consistently produced well-defined lines and text, free from the bleeding that plagues most plotters; however, the larger step size is apparent in the diagonals, which, although straight, are occasionally jagged. The lines of the Western Graphtec GD901 surpass the others with straight diagonals, keen corners, and lack of bleeding; the internal ROM text font could be more attractive, however.



To maintain consistency among the output plots, each plotter reviewed here produced an A-size plot combining text and a bar chart. In the vast majority of cases, however, D- and E-size plotters are not to be used for such tasks; their real utility lies in creating hard copies of larger, more complicated CAD diagrams.

Here are three examples of typical D and E plotter output; above left, the floor plan of a house plotted by the Western Graphtec GD9011; below left, the famous nozzle diagram, as interpreted by the JDL 750e; above right, a circuitry diagram from the LaserMaster XTIP 4080.

■ NEW PLOTTERS



FACT FILE

Western Graphictec GD9011

Western Graphictec Inc.
12 Chrysler St.
Irvine, CA 92718
(800) 854-8385
(800) 624-8796

List Price: \$8,950

In Short: A well-built E-size plotter with excellent performance and useful features.

CIRCLE 649 ON READER SERVICE CARD

readout displays messages during configuration and operation. All measurements are metric, but maybe it's about time we all started to think metric! A plethora of operating parameters can be set manually, in some cases overriding the GD9011's automatic sensors. The panel includes the normal buttons for pen selection, movement, and scaling, as well as some unusual ones for setting pressure and speed for each pen, aligning the plot to the medium edges, enabling a debugging mode, and even adjusting the contrast of the LCD display. Overall, the GD9011 operator panel is excellent.

The full range of Graphictec pens fits the GD9011, including fiber tip, water-based ballpoint, ceramic, and liquid ink in a variety of tip widths and colors.

The medium is held by pinch wheels and grit rollers. One wheel is movable for precise alignment on the medium edge. The GD9011, which handles A- through E-size media, automatically senses the length and width of the medium and adjusts its operation accordingly. It can even adjust the plot for media skew to parallel the edges of the medium.

Installing the test unit required removing the serial interface card provided and setting 24 DIP switches. The serial cable provided by Western Graphictec didn't work, but after some deciphering, it wasn't too difficult to build one that did. The early production sample I tested supported only Graphictec's GP/GL graphics language, but all shipped units will include HPGL as well.

Once set up, the GD9011 proved to be a delight. The plotter's intelligence makes operation simple and painless. The automatic media-size sensing is a real plea-

sure—you no longer have to worry about whether you've set everything right or oriented the medium correctly. The LCD display is helpful and convenient.

Before trying the GD9011, I was a bit concerned about its pen-speed rating. Its 15.7 inches per second isn't slow, but neither is it as fast as some other large plotters. I needn't have worried. While the plotter's speed in producing the ROM-font chart was not the fastest I've seen, it was in the upper echelon. The software-font test was quite fast, even quicker than several plotters with nominally higher speed. There's more to real throughput than the pen speed spec.

More important, output quality is superb. Diagonals are perfect, even at full rated speed, and accuracy is equally top drawer. The plots from the GD9011 were among the best I'd ever seen. The ROM font is standard Western Graphictec, which isn't gorgeous but will suffice for many uses.

The GD9011 is by far the best Western Graphictec plotter I have encountered. It is beautifully built, easy to use and efficient, and it creates superb output. I wish it held eight pens rather than four, but that's about the only serious criticism I can sling at this lovely machine. The competition in this price range is severe, but the GD9011 can more than hold its own.

Bruning Zeta 836

My first exposure to Bruning plotters in the PC Magazine Labs plotter project last year was an unexpected delight. Nicolet Computer Graphics Division, the name of this company until it became Bruning Computer Graphics recently, was well regarded in large-computer circles but less well known to the microcomputer community. Its B-

size Zeta 8 was an Editor's Choice last time around because of its high speed, fine plot quality, and solid construction (see "Adding a Touch of Color: 24 Plotters, \$399 to \$5,950," *PC Magazine*, Volume 4 Number 26).

The Bruning Zeta 836 is the Zeta 8's E-size big brother. Equally well built, it uses many of the same design elements as the smaller Zeta 8—the family resemblance is very strong. Its performance, too, is as good as that of its sibling.

Bruning's GML (Graphics Machine

■ The Zeta 836's operator panel allows you to rotate and scale plots, perform diagnostics, and issue pen commands.

Language) is standard on the Zeta 836. Optional HPGL, Tektronics, and CalComp emulations are available as well (\$250 each). Its 24 DIP switches and two rotary dials configure the plotter for a wide range of operating circumstances. Two cables, one for the IBM PC family and one for other computers, are supplied. The documentation for setting things up is unusually well written and illustrated, as is the rest of the documentation.

The pens are held in removable cartridges that accommodate up to eight pens, depending on size and type. Different cartridges hold different types of pens; some are self-capping. The cartridge moves along one axis of the plot, and a solenoid moves over the pen to be used and applies pressure to place the pen against the medium. Pen speed and pressure are adjustable. This clever system eliminates the need to extract pens from one side of the plotter and is even faster than traveling carousels. A wide range of pen types, widths, and colors are available.

The test plotter required special roll media with tractor holes on the edges, although Bruning makes a similar model that accepts sheet media, too (for an extra



FACT FILE

Bruning Zeta 836

Bruning Computer Graphics
777 Arnold Dr.
Martinez, CA 94553
(415) 372-7568

List Price: \$11,900

In Short: An expensive, competent E-size plotter; the fastest tested to date.

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■ NEW PLOTTERS



The Bruning Zeta 836 costs more than any other plotter tested, but it delivers quality goods. Designed for speedy performance, this sturdy machine clocked in with the fastest benchmark-test times while giving up nothing in the quality department. The documentation is well written and capably illustrated. The control panel provides useful information.

\$1,000). Vellum, coated bond, translucent, and two types of film are available.

The operator panel, which appears to be identical to the Zeta 8's, is a membrane design with pen selection, movement controls, and some 16 LEDs that indicate which pen is in use, data and handshaking signals, and error conditions. Special sequences of button depressions allow you to mirror, rotate, and scale plots, perform diagnostics, and issue pen commands. While lacking the helpful LCD readouts on some plotters in this class, the panel is useful, informative, and easy to use.

The Zeta 836 can also be controlled by a terminal attached directly to the unit as well as by the host computer. In addition, Bruning offers several FORTRAN-call-

able software routines and various font packs to expand the plotter's font capabilities (the Zeta 836 includes both fixed and proportionally spaced fonts as standard).

I tested the 836 in its HPGL mode, which worked perfectly the first time. When a plot is started, the Zeta 836 slowly pulls a quantity of medium from the roll, presumably so that it won't have to do so during the plot itself and risk inaccuracy. This process takes about 20 seconds. Including this overhead, the Zeta 836 executed our ROM-font benchmark test in just under 2 minutes, even running at our standard 2,400 bits per second. Its speed on the software-font chart was much slower but still toward the upper end of the speed rankings. The Zeta 836, like some other

high-end units, would draw the software chart faster at the higher bps rate at which it would normally be run. Running fiber-tip pens at the highest speed rating reduced quality slightly; backing off the speed control yielded line plots with a little sacrifice in throughput. The results with disposable liquid-ink pens, where you can adjust speed and pressure, were first rate.

Though the Zeta 836 is the most expensive plotter PC Labs has tested to date, it lacks some of the bells and whistles that less expensive plotters offer. However, this plotter gives the impression that it will rapidly churn out copious quantities of fine images practically forever.

JDL 750e and JDL GL Processor (Printer)

Can a printer really compete with high-resolution plotters in image quality and speed? We selected the JDL 750e printer as representative of the dot matrix breed, since it is specifically aimed at the CAD and graphics market.

The 750e accepts media up to 17 inches wide, and so it can produce standard C-size plots on either paper or vellum. An optional sheet insertion guide makes handling the big sheets easier. Once you place a sheet in this device, the printer loads and positions it at the touch of a button.

Three types of ribbons are available. A standard black-only ribbon is used for word and data processing. Two multicolor ribbons add either the three process colors (cyan, magenta, and yellow) or the three primaries (red, blue, and green).



FACT FILE

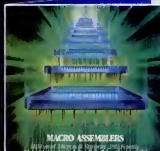
JDL 750e and JDL GL Processor

JDL Inc.
2801 Townsgate Rd., #104
Westlake Village, CA 91361
(805) 495-3451

List Price: JDL 750e printer, \$1,895; JDL GL Processor, \$1,290 with 1.5 Mbytes of RAM, \$1,690 with 3 Mbytes

In Short: A lovely 24-pin dot matrix printer suitable for both text and color graphics. Its companion GL Processor adds plotter emulation and saves time, but at high cost.

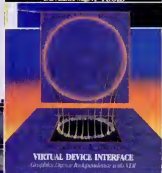
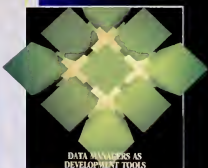
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■ NEW PLOTTERS

The 750e employs a 24-pin printhead that generates fine near-letter-quality (NLQ) text. Courier and Letter Gothic fonts are provided in several varieties of NLQ and draft quality. You can also download fonts into the printer's memory; up to five resident and four downloaded fonts are allowed.

The operator panel is simple but functional. A four-character LED readout displays the current font and pitch selected and any error conditions. My favorite was "POUT," a petulant but reasonable abbreviation for "paper out."

The 750e emulates the Diablo 630 daisy wheel, IBM 5182 Color Graphics Printer, the Epson MX, RX, FX, LX, and JX dot matrix line, and the Fujitsu DPL24 graphics printers. These emulations worked as expected. *AutoCAD* was also able to recognize the Epson emulation without problems.

The companion JDL GL Processor option converts vector data transmitted in HPGL into raster form. It uses a 68000 microprocessor and either 1.5 or 3 megabytes of RAM to store the incoming data and the resulting bit-mapped image that is sent to the printer. Even these prodigious amounts of memory are not enough to print a four-color C-size plot, but the 3-megabyte model can print four-color images on A- or B-size paper.

The GL box is beautifully constructed and elegant in operation. An LCD display programs the device's configuration parameters into nonvolatile EEPROM, so that you have to create the settings only once. A menu system logically structures the various options. The HPGL emulation even allows you to set pen width and color for 15 simulated pens. Two LEDs indicate status and the receipt of incoming data. The GL processor can also be used as a gigantic 3-megabyte print buffer, just in case you'd like to print *War and Peace* this month.

With the 750e set to emulate an Epson, the *AutoCAD* Plot Printer facility took 3 minutes, 20 seconds, to print an A-size version of the often-reproduced nozzle image, but image quality was rather poor. I interfaced to the GL processor with no problems and reconfigured *AutoCAD* for a Hewlett-Packard 7475 plotter. The nozzle now plotted in 5 minutes, 10 seconds, if



The JDL 750e dot matrix printer, when used with the JDL GL Processor, combines the capabilities of a fine printer with the ability to emulate the HPGL plotter language. The resulting crossbreed produces plots that are visually pleasing despite some jagged edges caused by the larger step size. The plotting speed was good, if not spectacular.

double-width pens were specified or 4 minutes, 50 seconds, with single-width pens. Image quality was far superior, though, especially in single-width mode. The tests with *AutoCAD* were run at 9,600 bits per second, as required by *AutoCAD* for the HP driver.

I then reconfigured for *KeyChart* to run the standard plotter charts. The system consistently refused to plot our test charts to completion on A-size paper. The top margin, intrinsic to positioning the top of the paper under the printer's bail, would not allow the bottom of the plot to print before the 750e's paper-out sensor stopped the plot (the printer POUTed). I simply used B-size paper for the A-size test charts, and the entire chart fit with room to spare.

Speed on the ROM-font test was pretty good, but the larger number of vectors to convert in the software chart slowed the 750e toward the bottom of the current batch of plotters. To some extent, the test methodology penalized the GL/750e combination more than it would a plotter, since the GL can accept data much faster at higher bps rates, and there isn't any mechanical activity or buffer size limitation to slow data input.

Output quality was good, especially considering the relatively limited 180 step-per-inch resolution. Jaggies were visible and a slight coarseness consistent with the step size was apparent, but the overall visual effect was quite pleasing nonetheless.

The rationale for the 750e itself is its fine performance and flexibility as a text



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■ NEW PLOTTERS

■ The GL Processor is an elegant device, but its \$1,290 or \$1,690 ticket seems a bit foolish.

printer combined with its ability to create color graphics with the same machine. Its price, \$1,895, is not out of line for a 24-pin color printer, construction quality is very good, and its ability to print on C-size sheets is a plus. I'm much less convinced about the GL Processor, though. It's an elegant little device, but its \$1,290 or \$1,690 ticket (for the 1.5- and 3-megabyte versions, respectively) seems a bit foolish. Some very fine plotters are available for what the GL Processor alone costs, not to mention the combined cost with the printer. For this kind of money, I would prefer two separate devices: a good printer (like the 750e) and a good plotter.

LaserMaster XT/P 4080 (Printer)

The LaserMaster XT/P 4080 is a laser printer that emphasizes graphics applications. It has been promoted heavily to the microcomputer CAD market, primarily because specific drivers have been prepared for *AutoCAD*, *VersaCAD*, and other leading micro CAD software.

The XT/P 4080 is based on the same Ricoh laser engine used in the AST TurboLaser (see review) and several other new laser printers. The printing mechanism it-

self is different from the more common Canon laser engine. Rather than one user-replaceable toner/developer cartridge, the Ricoh uses a developer cartridge that lasts much longer and separate small toner cartridges. The commodious input and output trays each hold 250 sheets, much more than the Canon design can accommodate, and paper emerges facedown in natural sequence, which avoids the annoying reverse collation required by Canon-based printers. The operator panel is much simpler, with copierlike icons for error indication rather than the more-informative digital readout on Hewlett-Packard, Canon, and similar machines.

LaserMaster Corp. designed the full-length PC card that forms the interface to the printer. The card includes either 1 or

1.5 megabytes of RAM, enough memory to allow full-page, 300-dot-per-inch graphics. The interface uses video signals rather than parallel or serial transmission for much higher transfer speeds. Installing the LaserMaster XT/P 4080 controller is a simple plug-in operation.

Most aspects of the XT/P 4080's operation are controlled by software supplied by LaserMaster. The basic driver emulates and is upwardly compatible with the Hewlett-Packard Laserjet and Laserjet Plus; some additional commands have been added to support high-speed vectors and fast raster graphics. On the other hand, landscape printing and macros haven't yet been implemented.

The driver and fonts must be loaded each time your system is booted. The font



The LaserMaster XT/P 4080, designed for the CAD market, produces high-quality plots in times that no plotter could hope to match. Several flaws mar its appeal: it suffers from some rough edges in its documentation and software, and the machine interface card both occupies a valuable slot and strains the power supply. Moreover, the cost may be too hefty for a machine that can make only black-and-white, A-size plots.



FACT FILE

LaserMaster XT/P 4080

LaserMaster Corp.
P.O. Box 1439
Minnetonka, MN 55345
(612) 944-6069
List Price: \$4,495

In Short: A graphics-oriented laser printer with good performance, although some rough edges need refining.

CIRCLE 66 ON READER SERVICE CARD

Interlude II

COWGIRL CAPER—Interlude # 125

Howdy, partner.

Howdy, partner???

You've got a date with a cowgirl tonight.

Uh oh. Have you been playing Interlude again?

Let's see...I'll need a hat, boots, chaps...and maybe spurs.

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As soon as you walk through the door, Cowboy!

Interlude II. The long-awaited sequel to the first adult computer game in history is finally here. It's provocative and playful! Outrageous and romantic! It has all the excitement of the original Interlude, plus significant new features.

The computerized interview, which is taken by one or both players, has been greatly expanded. It probes your innermost desires to discern your mood of the moment, your secret longings, your special fantasies, and then suggests for your pleasure one of its more than 160 Interludes. You can ask the computer for an Interlude for now, or one for later. Special options give each player added control over surprises and special erotica hidden in the Interludes.

The original Interlude took the computer world by storm six years ago, creating a media sensation:

FORUM Magazine: "The Interludes are imaginatively and sensitively written...the computer's recommendations are uncannily appropriate."

US Magazine: "The most edifying third party to join couples between the sheets since The Joy of Sex."

Chicago Tribune: "This marriage of computer technology and sex is natural...erases forever the image of computer-users as dull guys with slide rules in their pockets and square roots on their minds."

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■ NEW PLOTTERS



Plotters: Summary of Features

Physical Specifications	JDL 750e*	AST TurboLaser†	LaserMaster XT/P 4080†	Mural
Retail price	\$1,850	\$4,495	\$4,495	\$2,495
Maximum paper size	N/A	N/A	N/A	D
Paper movement	Platen	Internal rollers	Internal rollers	Flatbed
Paper hold system	Friction platen	Internal rollers	Internal rollers	Tapes
Number of pens	N/A	N/A	N/A	1
Pens auto-capped	N/A	N/A	N/A	○
Maximum pen speed (inches per second)	10	N/A	N/A	5
Pen speed adjustable	N/A	N/A	N/A	●
Step size (inches)	0.006	0.003	0.003	0.0035
Accuracy (percent)	N/A	N/A	N/A	±0.35
Buffer size	24K bytes	1 Mbyte	1.5 Mbytes	512 bytes
Acts as digitizer	○	○	○	●
Automatic paper feed	●	●	●	○
Weight (lbs.)	35	81.5	81.5	50
Interface				
Serial	Optional	Standard	N/A	Standard
Parallel	Standard	Standard	Standard	N/A
IEEE	N/A	N/A	N/A	N/A
Programming				
HPGL	Optional	●	●	●
Proprietary	○	○	●	○
Other	○	○	○	○
Bundled software	○	●	●	○
Subjective Evaluation				
Quality of construction	★★★	★★★	★★★	★★
Ease of pen use	N/A	N/A	N/A	★★
Ease of paper insertion	★★★★	★★★★	★★★★	★
Overall plot quality	★	★★★	★★★★	★★

N/A = Not applicable ●—Yes ○—No ★—Fair ★★—Good ★★★—Very Good ★★★★—Excellent Indicates Editor's Choice *Dot matrix printer

EXPLANATION OF FEATURES: Plotters are categorized according to the **Maximum paper size** they can accommodate. Size A is 8½ by 11 inches, B is 11 by 17, C is 17 by 22, D is 24 by 36, and E is 36 by 48. Printers that serve as plotters are either laser or dot matrix. **Paper movement** and **Paper hold system** are explained in the introduction to the reviews. **Number of pens** is self-explanatory. **Pens auto-capped** refers to automatic pen-capping capability, which is necessary to prevent

drying of the pen tips. **Maximum pen speed** is the fastest speed (rates can vary depending on whether the pen is moving diagonally or along the x or y axis). Almost all plotters allow for **Adjustable pen speed**, but, while some let you specify any speed within their range, others can adjust speed only in fixed increments, which are sometimes set by switches rather than by software. **Step size** and **Accuracy** are the major determinants of a plotter's ability to

create sharp and detailed plots. **Step size** is measured in either the number of steps per inch or by a distance measurement. At least theoretically, the more steps per inch, the better the resolution. The measure of accuracy used here is the percentage of accuracy over a long pen move. **Buffer size** shows the amount of RAM built into the plotter itself for storing instructions. Some of the plotters tested let you add RAM to expand the buffer size. Some plotters allow

downloading is much faster than with an HP LaserJet Plus. Only three or four fonts can be stored at once with the 1-megabyte controller, but many more can be accommodated with the 1.5-megabyte card. A utility converts HP downloadable fonts into the XT/P 4080 format for quick downloading; fonts can also be downloaded directly, albeit more slowly, with any HP download program. Only four monospaced fonts are supplied with the LaserMaster XT/P 4080, a rather ungenerous allotment.

The manual indicates that *AutoCAD* graphics can be printed in two ways. The standard LaserMaster driver interfaces directly to *AutoCAD*, so you can use the XT/P 4080 just as you would a plotter. Alternatively, a program called LMPLLOT reads a file created with *AutoCAD*'s DXF exchange format and plots that. Yet another supplied program merges *AutoCAD* images with text created by your word processor; this is the first blurb of a major effort in what LaserMaster chooses to call "computer-aided publishing."

The XT/P 4080's controller card draws quite a bit of power with all its memory. It worked correctly in the last available slot of the test PC, but the system ran noticeably warmer than it ever had before. LaserMaster recommends an XT, an AT, or a PC with an upgraded power supply.

We selected the XT/P 4080 for review partly because it has been advertised as including HPGL emulation, which would have allowed us to generate the standard *KeyChart* test graphic. Unfortunately, the HPGL emulator was not available by press

Numonics 5460	DraftPro 7570	Alphaplot II	Enter SP1200	Houston Instrument DMP-56	Western Graphic GD9011	Bruning Zeta 836
\$2,975	\$5,400	\$5,990	\$4,995	\$5,995	\$8,950	\$11,900
D	D	D	E	E	E	E
Roller bed	Roller bed	Flatbed	Roller bed	Roller bed	Roller bed	Roller bed
Grit wheel	Grit wheel	Magnetic strip	Grit wheel	Grit wheel	Grit wheel	Tractor
1	8	6	1	1	4	8
77	15.7	10	14	17	15.7	25
●	●	●	●	●	●	●
0.001	0.001	0.001	0.0025	0.001	0.001	0.001
±0.5	±0.2	±0.3	±0.1	±0.2	±0.15	±0.1
1K byte	7K bytes	8K bytes	14K/512K bytes	1,200 bytes	12K bytes	18K bytes
○	○	○	○	○	○	○
22	66	43	47	28	132	75
Standard	Standard	Standard	Standard	Standard	Optional	Standard
Optional	N/A	Optional	N/A	N/A	Standard	N/A
Optional	Optional	Optional	N/A	N/A	Optional	Optional
●	●	●	○	○	●	●
○	○	○	○	○	○	○
○	○	○	○	○	○	○
○	○	○	○	○	○	○
***	****	***	**	***	****	****
**	****	*	**	**	****	****
**	****	*	***	***	****	****
**	****	*	*	****	****	****

¹Laser printer

digitizing by letting you move the pen head with cursor keys to a desired location, then send its position coordinates to the computer by hitting a key on the operator panel; hence the Act as digitizer entry. **Auto paper feed** indicates capability for producing a sequence of plots without manual intervention by using a batch process (the graphics software in use must also allow this; most business graphics and small CAD programs currently do not).

The interface section shows what type of interfaces are available or standard. Most personal computers use either **Serial RS-232** or **Parallel Centronics** Interfaces. The **IEEE Interface**, also known as **GPB** (General Purpose Interface Bus) or **HPB** (Hewlett-Packard Interface Bus), is designed primarily for scientific and control applications.

The programming section lists graphics command languages. **HPGL**, the Hewlett-

Packard Graphics Language, is emerging as a de facto standard. **Proprietary** indicates a manufacturer's own command set. **Other** indicates that a manufacturer chose to emulate a graphics language other than **HPGL**. **Bundled software** indicates whether any commercial graphics software is included with the plotter.

Subjective Evaluation of four key considerations reflects the opinion of contributing editor Glenn Hart.

time (although it probably will be by the time you read this). Therefore, we had to employ **AutoCAD** as our driving software. We used the popular nozzle drawing since we had also used this image in some earlier reviews of CAD-oriented plotters.

LaserMaster didn't send the necessary utilities to drive the XT/P 4080 as a plotter directly from **AutoCAD**, but the DXF mechanism worked perfectly. With the same PC Bernoulli Box-equipped PC used in all the plotter tests, **AutoCAD** took 1 minute, 14 seconds, to convert the nozzle

to DXF, and **LMPLLOT** took another 1 minute, 43 seconds, to convert the data file and print the first copy.

An AT-type system would probably be even faster. Whether the time **AutoCAD** took to create the DXF file should be included could be argued either way; I did add both times on the results chart, since the extra time is necessary to produce a final printed output. While "plotting" time would vary with simpler or more-complex images (the **AutoCAD** nozzle actually takes somewhat longer than the **KeyChart**

ROM-font chart on a plotter), the key point is that the XT/P 4080 is much faster than any plotter. Incidentally, the printer's memory retains the image until replaced, and therefore I could print eight additional copies per minute. I also used **AutoCAD** to draw the portion of the **KeyChart** graph used for the magnified output and plotted it on the XT/P 4080 so that you could judge comparative line quality.

As a graphics-output device, the LaserMaster XT/P 4080 did very well. Image detail was excellent, and speed is much

■ NEW PLOTTERS

faster than even the fastest plotter (whether you include AutoCAD's DXF conversion time or not). It has some drawbacks, though. It ties up a precious slot in your computer, the documentation has many rough edges and even the software has a few, not all elements of AutoCAD drawings are supported by the DXF mechanism (the XT/P 4080 direct driver and HPGL emulation should work with any AutoCAD construct), and the price is high. Nevertheless, the XT/P 4080 is an outstanding tool for generating high-quality black-and-white A-size plots, especially if many users share one to amortize its cost.

AST TurboLaser (Printer)

AST Research has built an enviable reputation as the inventor and market leader in PC multifunction boards. The company also offers an extensive line of video adapters, memory boards, hard disk drives, and other devices for the PC and other computers. Now AST has entered the competitive laser printer fray with an impressive device designated the AST TurboLaser.

Installing the printer is straightforward. AST includes a full-length interface board, holding 1 megabyte of memory, that must be plugged into your computer bus. AST goes a step further than LaserMaster and states that a minimum 130-watt power supply is required for its interface. Since my test PC has the original puny 63.5-watt PC power supply, I installed the TurboLaser in my AT instead. This eliminates direct comparability of the timings for the TurboLaser.



Using its built-in HP 7475 emulation, the AST TurboLaser redefines the limits of high-speed plotting. Its plots are restricted to A-size black-and-white images. The longer step size limits the resolution and mars otherwise excellent plots with some jagged edges. For pure speed, however, the TurboLaser has no competitors, finishing our benchmark tests in one-fourth the time of the next-fastest plotter. As an A-size plotter, the TurboLaser is expensive; as a laser printer with plotter versatility, it could be a bargain.



The TurboLaser can be configured as LPT1, LPT2, LPT3, or either COM port by manipulating a few jumpers on the interface. In fact, you can specify both a serial and parallel port, and the printer will respond to output sent to either port.

The TurboLaser can emulate a Diablo 630 daisy wheel or an Epson FX85/185 dot matrix printer, and it can utilize either the Hewlett-Packard HPGL or Lasergraphics graphics languages (many large systems support these languages, but I haven't seen anything on the PC that uses them yet).

Every time you boot your PC, the TurboLaser's languages and operating software must be downloaded. This takes about 30 seconds on the AT, depending on how many fonts are being transferred to

the printer. AST supplies four families of fonts: Courier and Letter Gothic monospaced and Swiss and Dutch proportional (roughly equivalent to Helvetica and Times Roman), in over 100 variations of various sizes from 7 to 36 points and in both portrait and landscape orientations. The fonts take only a couple of seconds each to load, and AST's flexible software lets you specify any group of fonts you want to load. You also can send a command to the printer to change from one emulation to another.

Once the downloading is complete, the TurboLaser operates like any laser printer. The Diablo and Epson emulations work with several software packages. Print quality is typical of quality laser printers,



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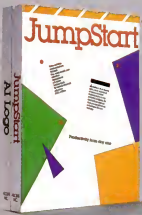
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■ NEW PLOTTERS

and the fonts are attractive.

The main event for our purposes here, though, is the HPGL emulation. Like the printer emulations, it works exactly as advertised with KeyChart and several other programs. You simply tell your software that you have an HP 7475A plotter and the rest is easy. You're restricted to A-size plots and black and white, of course, but otherwise you have an HP 7475A.

Even considering that I used a fast AT instead of the standard PC/Bernoulli Box combo, the TurboLaser's output speed

■ TurboLaser's times are an order of magnitude better than many of the other plotters tested.

was simply stunning. The ROM-font benchmark test took only 29 seconds from the moment I hit Return to the moment the finished chart slid into the printer's output tray! Like all laser printers, the TurboLaser takes a little longer for its first output sheet; KeyChart itself finished sending the output in well under 10 seconds. The software-font test chart took 1 minute, 11 seconds; undoubtedly the extra time is required by KeyChart to perform all the math for the font generation.

These times are an order of magnitude better than many of the plotters I've tested. Plot quality was very good considering that laser printers have only 300-dot-per-inch resolution. Many of the plotters tested offer 1,000 steps an inch, and a few even more. The difference in resolution is visible, but only under close scrutiny. The accurate positioning and small size of the dots goes a long way toward ameliorating the slightly limited resolution.

The TurboLaser's clear documentation is comprehensive and attractive in the AST tradition. In fact, the TurboLaser is a class act in all respects. The fonts are attractive, the Ricoh engine has some distinct advantages, and the TurboLaser is a good choice for word processing and general-purpose printing.

The HPGL emulation is a very fast and painless way to obtain high-quality graphics hard copy with a tremendous variety of software. I'm not sure anyone would pay \$4,495 for the TurboLaser in lieu of a plotter, but the graphics capabilities are a useful adjunct to a versatile performer.

Glenn Hart is a contributing editor of PC Magazine.

PC EDITOR'S CHOICE

Hewlett-Packard and Houston Instrument have competed for years in the mini and mainframe markets, and their battle in the personal computer arena is no less severe. Fortunately, their competition has produced two excellent plotters.

Hewlett-Packard's Draftpro 7570 is an obvious attempt by HP to penetrate the microcomputer CAD market. Given the Draftpro's aggressive pricing, excellent performance, solid construction, eighteen capacity, and the HP name, we predict great success for it.

The Houston Instrument DMP-56 also sports an attractive price. It creates the large E-size plots needed in so many architectural firms with first-rate image quality and smooth operation. It is only a single-open machine, but its ability to produce A- and B-size plots, as well as larger output, compensates for that limitation.

Several other devices deserve special mention. The Western Graphictech GD9011 is a beautifully built E-size platter with superb performance and tanklike construction. The Bruning Zeta 836 is the most expensive platter tested, but its roll media and very fast throughput make it an attractive choice for shops that need to create large numbers of plots conveniently and quickly. The AST TurboLaser can generate fine A-size black-and-white charts very rapidly and is a fine text device as well.

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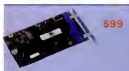
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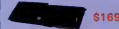
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**WHEN ONE
MAGAZINE IS
BOTH BIGGEST
AND FASTEST
GROWING,**

**THERE HAS
TO BE
A REASON.**

320,000

In the PC/MS-DOS market, there's no shortage of confusion.

But one thing is perfectly clear:

PC Magazine has both the largest and fastest growing circulation of any publication.

Its circulation of over 320,000 is up 24% from 1985*—and moving fast.

PC Magazine is growing so sharply in both subscribers and newsstand sales because it provides a unique response to PC buyers' most pressing need—comprehensive and reliable product reviews.

PC Magazine's readers are brand specifiers, technically knowledgeable people who are charged by their companies and organizations with making specific product choices. They call the shots when it comes to buying.

They know better than anyone

that although the microcomputer industry gives birth to many superb products, it also produces a raft of indistinguishables, and noncompatibles. Their job—should they wish to keep it—is to tell the difference.

PC Magazine has reduced the risks for its readers by taking on the grueling task of creating benchmarks and new testing methodologies and applying them to products in side-by-side comparisons. It's expensive, time-consuming and risky—and well worth the effort.

Helping readers find their way through the tangle of PC products is what we do best. Readers have responded by making us the biggest book in the field, offering advertisers the broadest coverage of the growing PC/MS-DOS market—and at the lowest cost per reader.

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These guys are specialists. They run PC Magazine's PC Labs, and the more products they examine, the better our readers feel.

By innovating the first and only program of comparative hands-on testing of software and hardware, PC Labs has given the publication's readers the confidence to make knowledgeable product selections in confusing and often dangerous circumstances.

Readers have responded by making PC Magazine the largest and fastest-growing book in the PC/MS-DOS market.

It makes sense. These are brand specifiers... people charged by their business or organization with making specific product choices.

Choosing products in this market, where product life cycles can be measured in days

and quality ranges from superb to dismal, is a hazardous profession. Mistakes cost money, and often jobs.

In this difficult and risky task, PC Magazine is crucial. Through PC Labs, the magazine pioneered the first (and still only) comparative testing program in the field. It devised benchmarks where there weren't any, invented testing methodologies, trained technicians. Then it lined up the products, side by side, and compared them feature by feature.

Our philosophy is simple: any reviewer can have an opinion. But having the facts leads to opinions you can rely on.

Helping readers make healthy buying decisions is mission #1 at PC Magazine. It's an effective prescription for both readers and advertisers.



THE BIG BOOK BY ANY MEASURE.

SURVEY OF PERSONAL COMPUTER PRODUCT BUYERS

9-1

- THE MORE YOU ASK, THE CLEARER IT GETS.**
1. Does your company or organization have personal computers installed at your office or work location? ☐ Yes ☐ No
- 2a. Do you use IBM PCs or compatible personal computers?
- At your office or work location (other than home): ☐ Yes ☐ No
- At home for personal or professional use: ☐ Yes ☐ No
- 2b. Approximately how many personal computers do you use for business or professional use?
- 3a. Are you yourself involved in any of the following activities within your company or organization for personal computer products? By ☐ Yes ☐ No
- needed, deciding on product features or capabilities, evaluating alternative products, recommending or deciding upon specific brands or software, the expenditure
- 3b. All part of your overall job responsibilities do you recommend, select or decide upon specific brands or software?
- 4a. Do you recommend, select or decide upon specific brands or software for your company or organization?
- 4b. (FOR EACH TYPE OF PERSONAL COMPUTER PRODUCT) Have you recommended, selected or decided upon specific brands or models in the past 12 months have other people in your company or organization?

PC MAGAZINE IS REGULARLY READ BY MORE OF THE RIGHT PEOPLE.

Number Of Times In Past 12 Months

People

Yes

16-1

(24,25)

(26,27)

(28,29)

(30,31)

(32,33)

(34,35)

The research is coming in and its message is clear:

PC Magazine is being read regularly and trusted by more of the right people. And with a circulation of over 320,000—the largest and fastest growing in the field—that's a lot of right people.

In surveys conducted by Market Probe International, Inc., a well-known independent research organization, customers obtained from lists of three hardware and software vendors identified PC Magazine as the publication they read most regularly.

Market Probe was also asked to survey six PC user groups across the country. These groups, founded to provide support and encourage communication among PC users, number many of the country's most influential and knowledgeable purchasers among their members. Once again the results are in and the answer is the same.

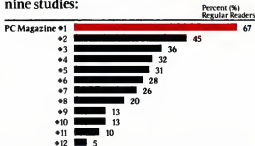
In Washington, D.C., Houston, New York City, Silicon Valley, St. Louis and Indiana/Kentucky—user group members ranked PC Magazine as the most regularly read publication.

In all nine studies, when asked to rate the magazines they read regularly, buyers and user group members consistently rated PC Magazine high-

est for in-depth, objective product reviews based on actual lab tests. They know only too well how difficult it is to make good product choices for their companies and organizations in the fast-moving PC market—and who provides the guidance that makes the difference.

Regular Readership Scores—Buyer/User Group Studies.

Here are the averages across the nine studies:



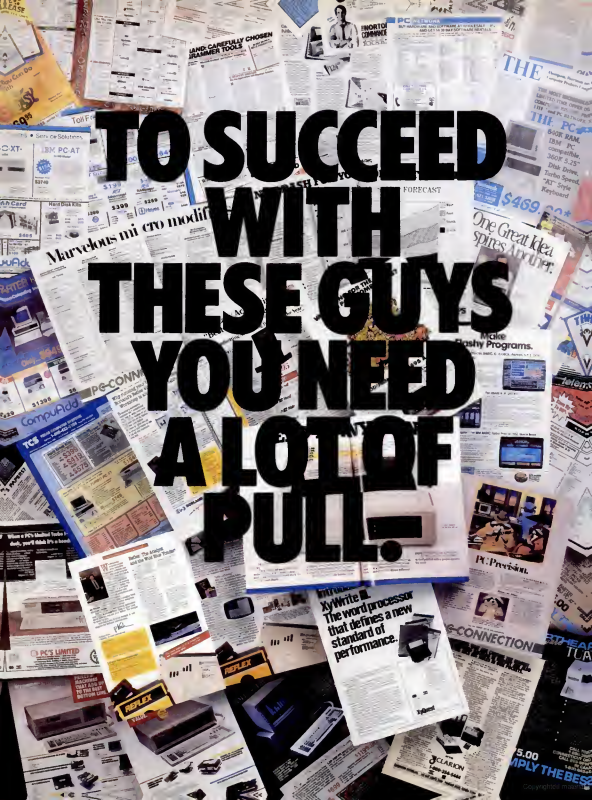
Base: Buyers/User Group Members Who Recommend/Select Brands of Microcomputer Equipment

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So we think it says volumes about the quality and responsiveness of PC Magazine circulation that it is cited as the top pulling magazine in the field by most direct marketers, and the one in which they make their largest investment.* For many it pulls not only the greatest overall return, but produces the lowest cost per order among any media they use.

That quality of response comes from a very special audience: a circulation of over 320,000 brand specifiers—the largest and fastest growing

in the field—who come to PC Magazine looking for reliable guidance in making difficult product selections.

They look to PC Magazine because PC Magazine's product reviews, backed by the resources of our PC Labs, are the best in the industry, and are in fact the only test-based comparative reviews available.

These brand specifiers also pay attention to advertising in PC Magazine. Recent studies by Market Probe International found that over nine of ten PC Magazine readers closely examine product advertising in the magazine.**

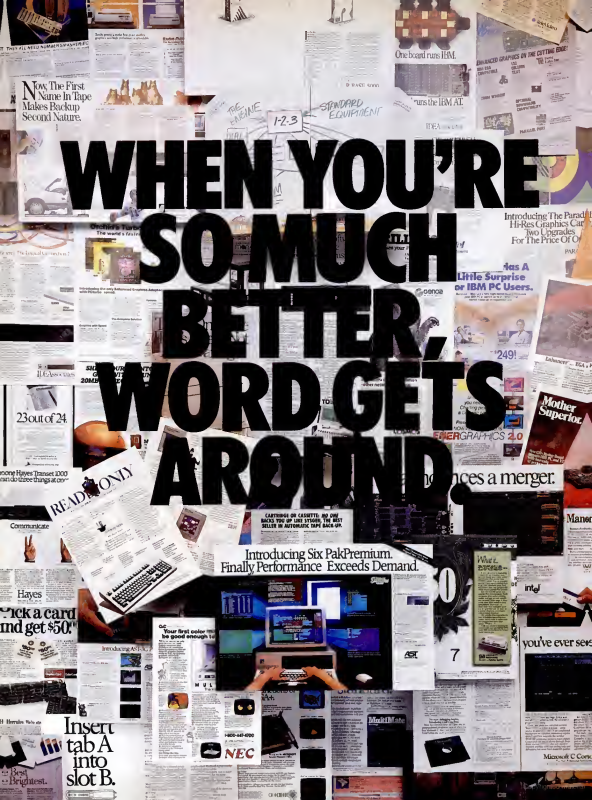
You may not be a direct marketer, but if you market products in the PC/MS-DOS industry you can use all the pull you can get. So benefit from the experience of those who measure response for a living. PC Magazine. More market, more quality.



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of PC World. Just take a look at the numbers for the first six months of 1986:

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LAN SOFTWARE COMES OF AGE

Once held back by the stringent demands of multiuser systems and the lack of a standard, the network applications market has come into its own.

Several software developments have spurred its recent growth.

Just a few years ago, the local area network market was uncharted territory. Only the technical wizards dared to venture into what you might call "no man's LAN." But after a quiet first step (does anyone remember the simple file-sharing IBM Cluster?), IBM legitimized networks in the fall of 1984 by introducing its first true network (the PC Network) and DOS 3.1, a version of DOS that allowed several users on a LAN to access a single program at once.

As always, hardware advances preceded the software that could take advantage of them. For a while, only a handful of database programs supported multiple users on a local area network. But networked applications software offers many potential benefits. Installing software on a LAN can eliminate file incompatibility problems by encouraging users in a company or department to accept a single product as a standard. And, of course, you need the proper software to enjoy the advantages

that LANs offer—notably their ability to share peripherals, hard disks, software, and even files while maintaining local processing power on the PC.

Many software publishers give price breaks for multiuser versions. David Hills of Novell notes, "A network version is usually bought for several users, so even at a discount it brings in large revenues. Also, once a company gets a network version, it is more likely to standardize on that product, leading to even more sales in the future."

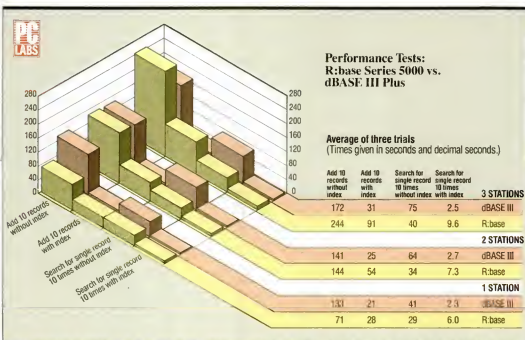
For all these reasons, networked applications have been ripe for growth. A few problems have held them back, but two recent software breakthroughs have brought the multiuser software market into its own. This article explores these developments and why they are spurring market growth and also examines the types of products that have resulted. Finally, to give you a concrete idea of how multiuser software packages differ from their implementa-

tions on a single machine, we tested the top two multiuser database packages, *R-base Series 5000* and *dBASE III Plus*.

LAN LOCKS LAN applications programs face greater file-management challenges than their simpler single-user counterparts. Unlike single-user software, which handles the requests of one person, LAN software must regulate the often-conflicting requirements of several users. Without special file-handling provisions on a network, chaos would reign. For example, two or more users may want to work on the same record, in the same file, or on the same report at the same time. Without special protection, both users could easily access the data, then make changes and save them. But only the last changes stored would appear in the file; other changes would be erased without a trace.

To prevent such conflicts, all network software—with the exception of certain utility programs that don't contend for

■ LAN SOFTWARE



These timings were designed to simulate heavy network use on one, two, and three stations. In the first test, we added 10 records to a 500-record database, checking to make certain that they did not duplicate existing records and that the department code was valid. In the second test, we retrieved the 250th record ten times in succession. Both tests were run with and without indexes.

While single-station times were slower for dBASE III Plus than for R:base Series 5000, R:base's speed degraded dramatically as workstations were added to the system. The speeds for dBASE showed less significant degradation. Indexing improved speeds for both programs, but the results were more pronounced for dBASE.

stored data—must provide some degree of file protection.

The simplest method by which network software secures files is to limit a user's access to different areas of the server. Access is tied to user names and passwords, so that data either remains private to an individual or can be shared with a controlled number of others.

File locking, the next level, allows you (or a program) to specify that a given file is in use and to prevent other users from accessing it at that time. This method is useful for word processing and spreadsheet programs in which only one person at a time can work with the file.

When two or more people must use a file simultaneously, you need to ensure that only one person can change a record at

■ LAN applications programs face greater file-management challenges than their simpler single-user counterparts.

a time. This safeguard, used primarily by databases, is called record locking. Similar to file locking, it lets you designate an individual record as being in use and unavail-

able to other users. If you plan to develop your own applications for LAN environments, you should investigate the coding requirements needed to create file and record locks.

CRUCIAL DEVELOPMENTS NET-BIOS and Novell's *NerWare* are the two breakthroughs that make file and record locking work. *NerWare* is an operating system shell that surrounds DOS and handles multiple-user access to network resources. *NerWare* is available in so many versions (the latest are called *Advanced NetWare*) that you can install it on nearly any network hardware on the market, from the low-end Orchid PCnet to 3Com's high-end Ethernet.

NetWare runs in precisely the same

way on each network; only performance speed varies. This compatibility gives PC owners more flexibility in configuring their systems and means that software developers can focus on meeting the requirements of a single operating environment. With these factors, *NerWare* gave the market the stability it needed for software development to proceed. In fact, more than 3,000 applications packages currently run on *NerWare*.

The second revolutionary development is NETBIOS, IBM's and Microsoft's addition to DOS 3.1. NETBIOS adds special input/output procedures to the basic DOS operations in order to allow file and record locking without additional shells such as *NerWare*. Novell and others now use this new feature, adding another level of standardization for multiuser software. But while any program designed to run under NETBIOS should work under *NerWare*, the converse is not necessarily true.

AVAILABLE APPLICATIONS With these developments in place, three categories of software have jumped on the multiuser bandwagon: word processing, database management, and accounting.

The resource-sharing capabilities of local area networks have powered the

grams (including *NerWare*) provide a mainframelike spooler that prints header pages for each job sent to the shared printer, so that the operator there can identify jobs sent by different stations. Some of the

newer multiuser word processing programs can access these spooling features directly. A secondary advantage of using word processing packages on a network is that they cut down on "sneaker

■ Recently, three categories of software have jumped on the multiuser bandwagon: word processing, database management, and accounting.

growth of LAN versions of word processors. Networked word-processing programs allow users to perform such CPU-intensive tasks as creating and editing their work on their own computer, storing the work on a shared hard disk, and printing it out on a shared printer. Many network pro-

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■ LAN SOFTWARE

networking." You can transfer files from PC to PC over the network and save yourself the trouble of running around the office to drop a disk off on someone's desk.

Novell lists many of the "big names"

in word processing programs in its directory of multiuser software: *WordPerfect*, *MultiMate Advantage* and *MultiMate Professional*, *Samna Word III* and *Samna+*, *OfficeWriter*, *WordStar 2000*, and

■ With multiuser database programs, businesses can set up a single large database system that allows many users to update information at one time.

Microsoft Word are a few of these.

Multiuser database programs let users share information as well as peripherals. With these packages' record-locking capabilities, businesses can set up a single large database system that allows many users to update information at one time.

The list of multiuser database packages reads like a *Who's Who* of information management. Novell lists *dBASE III Plus*, *Revelation*, *DataFlex*, *MDBS III*, *KnowledgeMan*, *Informix-SQL*, *dBMan-Net*, *ZIM*, and *LAN:Datacore*.

The ultimate database application for many businesses is accounting, and even relatively small companies have more bookkeeping transactions to log in than a single user can enter comfortably. It is not surprising, therefore, that accounting software has found its way onto local area networks. Besides using all the file- and record-locking capabilities of a standard multiuser database, many multiuser accounting packages permit you to specify various levels of security for financial data. Low-level staff can enter data without having access to sensitive financial records.

Many multiuser accounting programs existed in some form prior to the introduction of their LAN versions. Since many were written in COBOL or BASIC, it was relatively easy for their developers to add the appropriate commands to control record locking. Novell now supports Ryan-McFarland Corp.'s *MicroFocus* and *RM/COBOL*, two products that help programmers translate older programs. Soft-

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ware developers have also used powerful LAN database programs to create new multiuser accounting packages relatively quickly.

Many of the best-known accounting packages are available for LANs. Novell lists *EasyBusiness Systems*, *Open Systems*, *RealWorld*, *Hard Disk Accounting Series*, *Solomon*, *CYMA*, and the *Medallion* collection, among others, on its roster of multiuser programs.

PERFORMANCE While a LAN's access to shared resources is a considerable advantage, the problems involved in sharing resources (particularly disks) and the traffic resulting when many users try to access the same data can result in significant drawbacks. Transaction-oriented applications that transfer a great deal of data between the workstation and the server, such

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FACT FILE



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Redmond, WA 98052
(206) 885-2000
List Price: \$495
Requires: 256K RAM,
DOS 2.0 or later.

Not copy protected.

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dBASE III Plus
Ashton-Tate
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Advanced NetWare,
Version 1.02
Novell Inc.
1170 N. Industrial
Park Dr.
Orem, UT 84057
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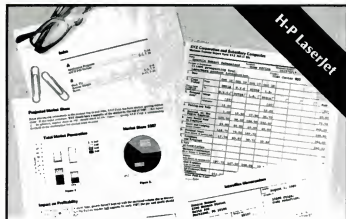
■ LAN SOFTWARE

as database and accounting programs, often suffer from reduced system response times. In general, when you access a hard disk via a network, it "feels" like you are working with a fast floppy disk.

Coding (for database applications) and installation also tend to be more difficult on a network. On the other hand, user interface, documentation, and support are roughly equivalent for single- and

multiuser implementations. Also, the performance of applications such as spreadsheets and word processors, which depend almost entirely on local processing resources (like CPU time and RAM), is not affected by the number of users on the network.

To illustrate how software can be designed for network use and how operating



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■ Coding and installation tend to be more difficult on a network, while user interface and support are roughly equivalent for single- and multiuser systems.

on a network can affect performance, PC Magazine Labs examined LAN versions of two multiuser database packages, *dBASE III Plus* and *R:base Series 5000*, in a simulated typical LAN environment. (As this article was being prepared, Microrim announced its new release, *R:base System V*, but this version was not available for testing. See "Project Database II," *PC Magazine*, Volume 5 Number 12, for in-depth reviews of *dBASE III Plus* and *R:base Series 5000*.)

For the first test, PC Labs created a program that simulates a user entering 10 employee records into a 500-record database. The program automatically checks that the department number is valid and that the employee number is unique. We ran the program with one, two, and three workstations logged onto the network and running the same program. We ran the program once without using indexes for the different tables and once with indexes.

The second test simulated a user calling up the record for an individual. We had one, two, and three users all try to access the same record at the same time (the record was 250th out of 500), both with and without indexes active. To make the

procedure measurable, we had it loop ten times.

The test system was a Novell *Advanced NetWare*, Version 1.02, system (the limited-user version marketed by Santa Clara) running on AST PC Net 1 cards with RG-59 coaxial cable. The server was an IBM PC with 640K bytes (on an AST SixPak), and the three workstations included a Compaq portable, an IBM PC, and a PC compatible, all with 640K. All machines ran DOS 3.1; although *NetWare* supports DOS 2.0 or later for multiuser applications, *R-base* requires DOS 3.1.

Workstation system clocks triggered the execution of the programs and timed them. While this could introduce an error because of processor load, it should be negligible and in any case is common between the different tests.

THE RESULTS The two programs' reactions were dramatically different as users were added to the system. Initially, single-station times were slower for *dBASE III Plus* than for *R-base Series 5000*, but *dBASE*'s times increased slowly as sta-

■ The performance of applications such as spreadsheets and word processors is not at all affected by the number of users on the network.

tions 2 and 3 were added. On the other hand, *R-base*'s speed degraded rapidly as stations were added; in some cases, times nearly doubled with each new station.

As expected, indexing vastly improved the speed of both programs. *dBASE* showed far more improvement than *R-base* when indexes were used. While it took time to maintain the indexes, efficient validation procedures saved even more time. One major difference that does not

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■ LAN SOFTWARE

show up in these timings was *dBASE's* blazing speed when it came to packing the 500-record file: it only took about 10 seconds to complete.

Installing a multiuser package on a net-

work can be almost as easy as putting it on your own PC, or it can be a real pain. *R:base* is the easier to install by far. It is not copy protected: you simply set up the appropriate directories on your server, assign

the necessary rights, and go to work. The program relies on NETBIOS calls for file protection, so we did not have to use any special commands, such as the Novell Flag command, to set up the data or program files. Creating data tables was easy, as always, thanks to the package's Express and Gateway facilities.

dBASE, on the other hand, is copy protected and requires a separate key disk for



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■ *dBASE III Plus's* biggest drawback on a multiuser system is the amount of code required to protect and manage the records successfully.

each station (either a *dBASE III Plus* system disk or a *LAN Pack* access disk). [We have learned that as of Sept. 1, 1986, *dBASE III Plus* is no longer copy protected.—Ed.] Ashton-Tate recommends that you install the access disk on a hard disk that is local to the station to permit diskless loading of the program. Although hard disks are cheaper than ever, it is contrary to the theory of LANs to expect each station to have one. When you start, *dBASE* has its usual slew of SET environmental variables at work, but you must change the default setting of the Exclusive variable since this setting assumes that you want to allow only a single user access to tables. I would change this right away in my CONFIG.DB file.

dBASE's biggest drawback is the amount of code required to protect and manage the records successfully. It takes some trial and error to get code that runs without errors caused by unavailable files or records. For the most part, *R:base's* coding is considerably simpler because *R:base* handles record and file locks without forcing you to add additional commands to lock records and files. *R:base*

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also has a Rule facility to validate the entered data without the need for additional coding; with *dBASE* you must use specific procedures for this task. The only problem we had with *R:base* was setting the timer to a long enough interval so that the package didn't give up while waiting for a locked record.

R:base did cause us one problem, however, which may have been a result of its unorthodox file-management techniques. Instead of using separate DOS files for tables, screens, and indexes, the program clumps them into three separate files with similar names. We deleted added records and packed the database after each trial to get rid of the space that had been taken up by the deleted records so that each run would occur under roughly the same conditions. Microrim recommends that you back up your database before running a pack, and after our experiences I would have to underscore that recommendation. The results were not consistent, but we frequently lost our database files and had to restore them after attempting a pack on the server.

Although implementing these packages on the network negatively affected their speed (as the number of workstations in-

■ Many people are finding that the electronic-mail facility present in most networks is one of the "sleepers" benefits of their installations.

creased, the speed decreased) and the ease of installation and coding, it did not affect any other factor you'd be likely to consider when buying a single-user version of the package. The user interface, documentation, and support of the multiuser versions are similar to what the company provides for its single-user implementation.

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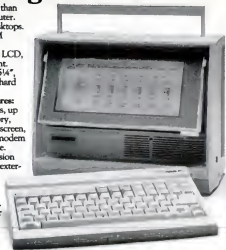
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■ LAN SOFTWARE

WHAT'S AHEAD While multiuser versions of the basic applications are now available, expect the range of LAN software to expand as the number of networked PCs continues to grow.

Multiuser integrated software has already arrived: *The Smart Software System* from Innovative Software, with modules for word processing, spreadsheets, database management, and communica-

tions, is now available in a multiuser network version (see "Integrated Applications: The Smart Solution," *PC Magazine*, Volume 5 Number 15).

Communications is another area ripe for development in LAN settings. Many people are already finding that the electronic-mail facility present in most networks is one of the "sleepers" benefits of their installations. These programs permit users to send messages either in real time to another user's screen, or to an electronic

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■ Many companies install more than one network in order to get acceptable performance. New developments allow these networks to communicate with each other.

mailbox where they can be retrieved later. For businesses with flexible working hours or multiple shifts, this electronic message center can facilitate communications between network users. A number of software publishers are already marketing standalone programs that improve on the bundled e-mail programs sold with *NetWare* and other networks.

Another recent communications development is a LAN version of Microstuf's *Crosstalk XVI* communications package. Designed to work with any DOS 3.x NETBIOS-compatible network, it permits workstations to gain access to one or more modems attached to the file server. While modems are not all that expensive, the telephone lines that handle the calls can be costly to install and maintain. Multiuser *Crosstalk XVI* offers the promise of shared access to asynchronous telecommunications.

Local networks are "local" by definition, and frequently the number of users accessing the available resources puts a practical limit on the distance that can be

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■ LAN SOFTWARE

covered by one system. Many companies install more than one network in order to get acceptable performance. New developments make it possible for these different networks to communicate with each

other, so that users on one may transparently access resources (or e-mail) on another. Similar developments are underway that will give network users access to mainframes through gateway connections.

One final software application with significant LAN growth potential is computer-aided design. Design projects are frequently undertaken by teams of engineers or others, and each member must share his or her work to make certain that it will fit into the finished product. CAD packages essentially are massive databases with powerful programs that are able to manipulate the data and display it on the screen or plotter in graphic form. LAN versions of these programs will speed up the development process, making designers more efficient as they work on different aspects of a project.

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make them work if you stick to these three popular and basic applications: word processing, database management, and accounting. As data exchange and resource access grow in priority, you will find more communications products on the market that will allow your network to hook up with and talk to just about anything you can imagine based on silicon. Before long, you will find special vertical market packages, like today's crop of CAD programs, available in LAN versions. Micros of the world, unite! You have nothing to lose but your dependence on floppy disks. ☐

Alfred Poor is a frequent contributor to PC Magazine.

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■ PC LAB NOTES: 1-2-3 MACROS ■ JARED TAYLOR

A COMPREHENSIVE GUIDE TO 1-2-3'S MACROS

Behind 1-2-3's simple structure is a dimension of features that can automate your spreadsheet routines. Here's how to start your own arsenal of macros.

Lotus's 1-2-3 is a marvelous program that uses numbers as fluently as a word processor uses words. It can easily let you do a job ten or even a hundred times faster than you could with a calculator. Its very power can open your mind to applications you might never have thought of without it. But some users are so pleased with the 1-2-3 spreadsheet that they never even think of tapping that other great reserve of 1-2-3 power: macros. Just as spreadsheets save you from the drudgery of numbers, macros save you from the drudgery of 1-2-3.

WHAT IS A MACRO? Macro is short for macro instruction, a command that causes a series of other commands to execute. If you've ever used a keyboard control program like *ProKey* or *SuperKey*, you've used macros (if you haven't, see "Keyboard Macros and Redefinition," PC Lab Notes, Volume 5 Number 12). Those programs let you attach a whole paragraph or a whole sequence of commands to a single key. One keystroke, then, does the work of a hundred keystrokes.

1-2-3 macros do the same thing. All the 1-2-3 commands you can type from the keyboard you can put into a macro. Hit a key combination, and 1-2-3 will run a series of commands by itself. You can turn almost any repetitive 1-2-3 keyboard chore into a macro that does the job quickly and effortlessly. Writing a 1-2-3 macro is like writing a computer program. Learning how to do it is like learning a language like BASIC or Pascal—with one huge difference. You have to spend some time and get

pretty good at BASIC before you can write a genuinely useful program. Not so with macros. You can write wonderfully useful "programs" as soon as you begin. Some of the shortest and simplest will save you the most time.

If you use 1-2-3 but have been put off by the idea of programming, macros are a great way to begin. You may then find you like writing "code" and decide to learn other languages. But there are plenty of people who can write wizard macros but have never written a line of BASIC.

HOW THEY WORK The instructions you put into a macro are like the keystrokes you use when you enter the same instruc-

tions at the keyboard. For example, if you wanted to change the width of the current column in a spreadsheet to six, you would type the commands for /Worksheet Column-Width Set 6 <Enter>, or

```
/wcs6<Enter>
```

For this series of instructions to run as a macro, you have to do three things: (1) enter a representation of these key strokes into a cell or cells in the worksheet; (2) identify the instructions so that 1-2-3 recognizes them as macro instructions; and (3) actually run, or "invoke," the instructions.

Let's create this simple macro. First, blank the 1-2-3 screen with

```
/wey
```

then move the cursor to cell C4. All macro instruction sequences must be, in 1-2-3 parlance, labels rather than numbers. In the case of our column-width macro, the first part of the command is the slash (/) that brings up the main 1-2-3 command menu. If you type it now, 1-2-3 will think you want to give a command rather than enter a label, so the first thing you should enter in the cell is the apostrophe (') label prefix, which is followed by the commands. Type

```
'/wcs6
```

It can be uppercase, lowercase, or any combination—1-2-3 doesn't care.

At the keyboard, you'd enter the column-width command with the Enter key, but if you hit Enter now, it will enter what you've typed so far into the cell. Instead, you want the cell to contain an instruction,

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equivalent to Enter, that will be executed when the macro runs. In 1-2-3 language, the tilde (~) is the symbol for Enter. Thus the complete keystroke sequence from the keyboard is

```
'wsc6 "<Enter>
```

The tilde represents the Enter to be executed by the macro, and the Enter that follows it represents your entry of the sequence into the cell (of course, Enter will be executed by 1-2-3 and will not appear in the cell).

You now have a small macro program that, when run, will change the width of the column the cursor is in to six. However, 1-2-3 doesn't yet know it's a macro; it's still only a label with odd contents. To tag it as a macro, you must give it a special kind of range name reserved for macros. Macro range names are all two characters long; they begin with the backslash (\) and end with a letter from A to Z, or the number 0 (see sidebar "The Autoexec Macro," for more about the number 0).

You might give this macro the mnemonic name \W, since it changes the width of a column. It's always a good idea to identify the macro by putting its name in the cell to the left of the macro. Do that now, and don't forget to start the name with the apostrophe label prefix, because the backslash itself is the repeating label prefix. Without the apostrophe you'll get a string of W's instead of \W.

Now you can identify the sequence of instructions so that 1-2-3 recognizes it as a macro. Leave the cursor in the cell with \W in it and create a range as follows

```
/rn1r "<Enter>
```

This gives the range name \W to the cell to the right—that is, the cell with the series of instructions in it. You can use /Range Name Create instead of /Range Name Label Right, but it's a good practice to put the range name to the left and transfer it to the cell to its right. It forces you to label your macros and also lets you create a bunch of range names at a time.

Now your macro is ready to run. Hold down the Alt key and hit W. The control panel will flash briefly, and the column width will change to six. It's as simple as that.

Now you know the fundamentals of

THE AUTOEXEC MACRO

Macros have names that are single letters of the alphabet, like \A or \T, but one macro can have the name \0. Backslash-zero is a special name reserved for the autoexec macro. This macro will begin operating as soon as you load the spreadsheet that contains it into 1-2-3. You don't have to hit Alt-anything; it goes automatically.

This procedure is handy when there is an operation you need to do every time you load a particular worksheet. For example, you might have written a macro that consolidates worksheets with the /File Combine command. You may need to do consolidations of this kind only once a month, but whenever you load the consolidation worksheet, the autoexec macro carries out the operation automatically.

Unfortunately, you'll find that you can't run an autoexec macro a second time after you have loaded its file and it has run automatically: Alt-0 works only once.

However, if the macro is a useful one that you want to run with an Alt-*whatever* sequence, just give the same macro another name. If you call it \Q as well as \0, it will autoexecute as \0, but you can also run it the second time with Alt-Q.

Remember, you can give the same cell more than one range name.

Many people use autoexec macros in auto-loading worksheets. As you know, every time you load 1-2-3, it searches the

default directory for 1-2-3 files.

If one of those files is named AUTO123.WKS (or AUTO123.WK1 in Release 2.0), 1-2-3 doesn't wait for the /File Retrieve command, but loads that worksheet automatically. If the worksheet contains an autoexec macro, the macro runs automatically as well—two automatic execution steps in sequence.

One of the most common autoexec macros to put into an auto-loading worksheet displays a simple menu of the worksheet files in your default directory. The macro is just three characters:

```
\Q /fr
```

If your system is set up this way, whenever you load 1-2-3 it will load the auto-loading worksheet and execute /File Retrieve. Since the macro doesn't specify which file to load and doesn't complete the retrieve operation, 1-2-3 stops executing just at the point where it displays a list of worksheet files in the control panel. You can then move the cursor to the file you want to work with and hit the Enter key.

This is the simplest possible 1-2-3 start-up menu. Many people have designed more elaborate ones that let you change directories and view different kinds of files, but they almost always work on the principle of an auto-loading worksheet with an autoexec macro.

—Jared Taylor

macro writing, and you have a useful macro that does in two keystrokes what would normally take six. Move the cursor into some other columns and run your macro a couple of times to see how it feels.

The Alt-*whatever* combination is how you run, or invoke, macros. If you had given your instruction sequence the range name \C, you would hit Alt-C in order to make it go.

MAKE IT FANCIER It's easy to jazz up this basic column-width macro. As it is now, you have to move the cursor to the column you want to make wider and hit Alt-W. If you have eight or ten columns

you want to widen, you've got to hit Alt-W Right Arrow Alt-W Right Arrow until you're finished. But with a few additions, the macro will do this all by itself.

There's a brute force way and an elegant way to improve the macro. The brute force way is shown in Figure 1. Cell C4 was the original macro, and cells C5 to C10 are additions. The [right] in cell C5 is macro language for the Right Arrow key; it moves the cursor one cell to the right. You have to use some kind of representation of that key because if you just hit Right Arrow while you're writing macro instructions, 1-2-3 interprets it as it would an Enter and ends the cell entry. The commands

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■ PC LAB NOTES

	A	B	C	D
1				
2				
3				
4		\W	/wcb6"	
5			{right}	
6			/wcb6"	
7			{right}	
8			/wcb6"	
9			{right}	
10			/wcb6"	

Figure 1: *Bride-force technique to make a macro do something more than once—in this case, set a column width to six.*

{left}, {up}, {pgdn}, etc., all work in macro the way you would expect them to.

Cell C6 repeats the instructions in C4, and all the rest of the macro is repetition. This macro will set the width of the current column to six, then move to the next three columns to the right, setting each of them to six as well.

The macro will do all this without interruption because of the sequence that I-2-3 follows when it executes—or processes—macro commands. When you start a macro with the Alt-whatever combination, I-2-3 begins executing the instructions in left-to-right order in the cell where the macro begins—in this case, cell C4. When it runs out of instructions in that cell, I-2-3 looks for instructions in the cell immediately below. If it finds some, it executes them, once again in left-to-right order. I-2-3 will chug its way, top to bottom, through a whole column of macro instructions until it finds a blank cell. Then the macro stops running, and I-2-3 returns to ready mode.

In the first column-width macro, cell C5 was blank, so after I-2-3 ran all the instructions in cell C4, the macro was over. In the new macro in Figure 1, I-2-3 finds more instructions in C5 and keeps executing them until it runs out of gas in C11.

ELEGANCE There's a better way to make a I-2-3 macro do something more than once. Rather than write new macro instructions for every repetition, you can make I-2-3 go back and execute the same instructions over and over.

Get rid of what you put into cells C6 through C10, and in cell C6 put in the following line

/xg\W"

DIFFERENCES BETWEEN RELEASES 1A AND 2.0

The macros in this article use /x commands instead of the newer versions of those commands introduced in Release 2.0 of I-2-3. The reason is that both versions of the program can process /x commands, but Release 1A will not process the new Release 2.0 commands. With the /x commands, these macros will work with any version of I-2-3. They should also work with imitations of I-2-3. If you use Release 2.0, you can substitute the newer equivalents of the /x commands as follows:

Release 1A	Release 2.0
/xg	{branch}
/xl	{getlabel}

/xn	{getnumber}
/xi	{if}
/xq	{quit}

The Release 2.0 commands have special formats, so you'll have to read the I-2-3 manual to see how to use them. It may be a bad habit, but I still use the /x commands even in Release 2.0 because they're shorter.

Release 2.0 has, however, a considerably beefed-up macro language that lets you do amazing things not possible with 1A. But if you're just starting out with Release 1A, don't worry. Its macro language has more than enough power to keep you challenged for a long time.

—Jared Taylor

Remember to start the line with an apostrophe, or I-2-3 will think you are executing a command from the keyboard. You should now have what's shown in Figure 2, but don't run the macro yet.

The first two lines of the macro are clear enough: the first sets the column width of the current column, and the second moves the cursor to the next column so you can change its width. The third line has no effect on the screen at all. Instead, it gives an internal instruction to I-2-3 to go back and start executing the macro again from the beginning.

The /xg command is therefore a macro programming command. It's a I-2-3, Release 1A, technique (see sidebar "Differences Between Releases 1A and 2.0") for making I-2-3 execute macro instructions in some way *other* than the usual top-down order. The /xg command is one of a family of eight /x commands, and the letter g in it

	A	B	C	D
1				
2				
3				
4		\W	/wcb6"	
5			{right}	
6			/xg\W"	

Figure 2: *A more elegant way to make a macro do something more than once—essentially, a repeating loop.*

is short for Goto. The /x commands are what gives the I-2-3 macro language enough flexibility and power to be considered a programming language.

The /xg command is important and deserves an explanation. It has a standard format, which is /xgdestination, where destination can be a cell address or a range name. Destination has to be followed by a tilde; it is the location where you want I-2-3 to continue executing macro instructions. In cell C5, the destination is \W, or the name we gave to cell C4, where the macro begins. Instead of writing /xg\W you could write /xgC4, and the macro would behave in exactly the same way. The effect is to tell I-2-3 to interrupt its usual macro-processing sequence and go to wherever the /xg instruction tells it to go—in this case back to the beginning of the macro. Processing starts all over again.

If you think about this macro, you'll realize that there's no way for it to end. It sets a column width, moves the cursor to the right, loops back to the beginning of the macro, sets a column width, moves the cursor to the right, on and on until it bumps into the far wall of the spreadsheet. It's what programmers call an endless loop, and they don't usually like them.

This endless loop is benign, though, because there's an easy way to stop it: hold

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■ PC LAB NOTES

down the Ctrl key and hit Break (also called ScrollLock). This will stop just about any macro in its tracks, and it's good to know how to do that. Macros, alas, sometimes run amok. So remember that combination: Ctrl-Break. (Actually, in Release 2.0 you can write macros that won't even stop for Ctrl-Break, but not many people use them.)

Now try running your endless loop macro by hitting Alt-W. You'll see that the macro sets column widths a whole lot faster than you can. After you've had enough, kill the macro with Ctrl-Break. You'll get an Error sign on the screen, but just hit the Esc key and you'll be back in ready mode. You now have a moderately useful little macro that will set column widths until you stop it.

DIFFERENT WIDTHS You won't always want to set your column widths to 6. Sometimes you might want a width of 5 characters or 14. The inelegant solution is to edit cell C4 and put a different number into it if you want something other than 6. But let's get fancy and write a macro you can change every time you run it.

Tinker with your macro until it looks like the one in Figure 3. Editing macro instructions is just like editing any kind of label. By the time you're finished, you've done quite a lot: you've moved the contents of C5 and C6 down to C7 and C8. C5 is now blank, and all C6 has in it is a tilde. C4 hasn't exactly moved, but its last two characters, '6', are gone. The first line in C3 is a work of art I'll explain presently. Finally, there are two new range names, \N and BLANK, in column B. Don't forget to use /Range Name Label Right to attach those names to the cells to their right.

The name of the macro is now \N (for new), and if you did your typing correctly, it will run when you hit Alt-N. (See sidebar "Debugging Macros: One Step at a Time" if it doesn't.) First the macro \N puts up a message in the control panel that says "Enter column width:". You then type in a number, and the macro will start setting column widths to that number, just as the earlier macro did. Ctrl-Break will stop it. After you've stopped the macro, you will notice that the number you entered at the beginning is now in the cell with the name BLANK.

DEBUGGING MACROS: ONE STEP AT A TIME

I-2-3 macros, just like programs, don't always do what you expect. Sometimes the logic of the instructions gets complicated, and sometimes you just make typing errors. A single typo can trash an otherwise perfect macro.

If you're copying a printed macro and it doesn't work, chances are you mistyped it. You also might have forgotten to assign all the right range names to the right cells. Check carefully. If you're designing your own macro and it won't run, you have a different problem. If the macro is more than a few lines long, it may not be possible to tell from the way it messes up exactly why it's messing up. That's when you need I-2-3's gift to the macro programmer: single-step mode.

When you're in this mode, the macro will run one step at a time rather than flashing by so fast you can't see where it's going wrong. To start single-step mode, hold down the Alt key and hit the first function key (Alt-F1). You'll get a Step message at the bottom of the screen that lets you know you're single-stepping. Now start your macro. Nothing

will happen. To make the macro go, start hitting a key (I like the Spacebar). Every time you hit the key, the macro will take a single step. You can stop anytime and examine the screen to see what's happening. Often, this is the only way to catch errors. Many macros will run to their ends in single-step mode; all you have to do is keep tapping. However, any macro that pauses for input from the keyboard has to be helped along (such as the macros in Figures 3 and 4). When the macro prompts you for a value, type 1 and hit Enter just as you would if the macro were running normally. Then start hitting a key again to restart the macro. If you need to get out of the macro, Ctrl-Break will take you back to the ready mode. When you're finished with single-step mode, hit Alt-F1 again to switch back to ready mode. The Step message will go out. Even if you're not having trouble with macros, it's edifying to single-step your way through a few to see how I-2-3 operates. It has some peculiar habits, and single-step mode is the only way to watch it in slow motion.—Jared Taylor

	A	B	C	D	E	F
1						
2						
3		\N	/xlEnter Column Width: "BLANK"			
4		\N	/w6			
5		BLANK	-			
6						
7			{right}			
8			/xg\N"			
9						

Figure 3: A macro that prompts for a column width and then formats columns accordingly.

	A	B	C	D	E
1	\N	/xlEnter Column Width: "BLANK"	Prompt for column width		
2	TEST	/xllow many times? "TOTAL"	Prompt for No. of repetitions		
3		/xlTOTAL=8"/xg	Test for No. of reps, quit		
4		/w6	Start column width command		
5	BLANK	9	Left blank for column width		
6		-	End column width command		
7		{right}	Move cursor right		
8		/dftOTAL="TOTAL-1"1--	Decrement TOTAL		
9		/xgTEST"	Loop back to TEST		
10					
11					
12	TOTAL	8			
13					

Figure 4: A macro that prompts for a column width and number of repetitions and proceeds accordingly.

■ PC LAB NOTES

How does this macro work? The first line uses another one of those fancy /x commands, and this time the letter l stands for label. The command puts up a message, waits for you to enter something from the keyboard, and stores what you entered in a specified cell. It has the general format `/xlmessage "location"`. In Figure 3, the message, which can be any string of text you choose, lets you know that what the macro is waiting for is a column width. The location where your response will be stored is the cell named BLANK. Once again, location could be a cell address, C5, rather than a range name.

After the macro prompts you and gets a response, 1-2-3 goes on to cell C4, which is the first part of the column-width command. It gets as far as /wcs and then looks for more characters in the cell below. What it finds is the response you gave to the prompt, which it then incorporates into the column-width command. The cell named BLANK was left blank on purpose so as to receive the information you supplied at the prompt. The tilde that completes the command is in the cell below BLANK. The rest of the macro works as the one in Figure 2 did, looping back to \W so as to keep setting column widths until you kill the macro with Ctrl-Break.

In Figure 2, the column-width command was all in one cell of the macro—C4. In this new version, you have strung the same command out over three cells, C4, C5, and C6. This demonstrates the flexibility with which 1-2-3 processes macro commands: you can have many instructions in a cell or just one. 1-2-3 reads what's in the cell, be it 15 characters or 3, and moves on to the next cell. The only limit to this flexibility is that you can't break up anything between curly brackets and put it on two or more lines. If you tried to put `[ri in C7 and ght]` in C8, the macro wouldn't work.

The macro in Figure 3 can easily be modified to do something different. Just change the last line to `/xg;N`. Think for a moment what that would do. Instead of looping back to C4 where the column-width command begins, 1-2-3 would loop all the way back to the beginning—that is, to the cell named \N. Once more, you'd get a prompt asking for column

MACROS UNLIMITED

Getting around Lotus's restriction on macro names.

Theoretically, you can have only 27 macros in a worksheet, one for each letter of the alphabet and one more for the `autoexec` macro (see sidebar "The Autoexec Macro"). This sounds like plenty, but it's possible to run out. Also, with single-letter names like \P or \S, it's easy to forget what each macro does.

Here is a macro that lets you use an unlimited number of macros and also lets you give macros names that are more meaningful than a single character.

```
\S      /xlEnter name of Macro: "NAME"
NAME    /xg
        -
```

For this macro to work you need several different macro routines stored in the worksheet. The beginning cell of each macro must have a range name, preferably one to tell you what the macro does. A macro to print the worksheet could be called PRINT, and one that does data queries could be called QUERY.

These are perfectly good range names, but they aren't valid macro names like \P or \S. You couldn't run these macros with a simple `Alt+whatever` sequence. However, with the /xg command, you can tell 1-2-3 to start processing macro instructions at the cell named PRINT or QUERY.

That's exactly what the \Z macro does. If you wanted to run the PRINT macro, you'd hit `Alt+Zprint<Enter>`. Alt-Z starts the macro. Since it uses the /xl command (see main text), the first thing it does is display a message, which asks you to enter the name of the macro you want to run. You type in PRINT or QUERY, hit Enter, and your response is stored in the cell named NAME. The next cell starts the /xg command, and the last two cells complete it. The trick of leaving part of a command blank (in this case the cell named NAME) and filling it with the response to the /xl command is exactly the same as the one used in the macro in Figure 3. Once the /xg command is complete, macro processing continues with whatever instructions are in the cell you specified when you answered the prompt.

That cell doesn't have to be anywhere near the \Z macro itself. Part of the beauty of the /xg command is that it can hand off macro control to any cell in the whole worksheet. Obviously, when you answer the Enter-name-of-macro prompt, you have to give a name of a range that actually exists. Otherwise you'll get an error message and you'll have to start with Alt-Z all over again.—Jared Taylor

width before 1-2-3 executed the rest of the macro. This would be a good macro to use if you had to set a bunch of columns to different column widths. This kind of minor modification is sometimes all it takes to make a macro do something new and different. Try it. Don't forget to hit Ctrl-Break to get out of the macro and back to ready mode.

You may have noticed that although 1-2-3 doesn't care whether your macro text is in uppercase or lower, I do. I write range names in all capitals and keep everything else in lowercase. You can adopt whatever style suits you, but I find it's useful to be able to tell at a glance what part of a macro consists of range names and what part of commands. The important thing is to be consistent.

You also may have noticed that every time a macro uses a named range, I put the name of the range in the cell to the left. Those names don't have to be there for the macro to run, but they make it much easier to remember what the macro does.

FINAL TOUCHES There's still something inelegant about the macro in Figure 3. Ctrl-Break is a crude way to stop it. You have to watch its every move and cut it off at the right moment. If you tinker with the macro a bit further, you'll get a more refined version, as shown in Figure 4. This macro prompts you twice: once for the column width and once for the number of columns to set to that width. After you give it that information, it will

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■ PC LAB NOTES

MY FAVORITE MACRO

That is, the one that saves the most work.

Not everyone has a favorite macro, but I do. I've never seen a better combination of simplicity and usefulness. I just wish I had invented it. The problem this macro solves stems from the fact that IBM put numbers and cursor arrows on the same keys. You have to toggle back and forth with NumLock every time you decide to switch from arrows to numbers or back.

In 1-2-3 that's a pest because it would be handy to be able to use those keys as both a number pad and arrow keys at the same time. For example, if I have to enter a long column of numbers, I'd like to be able to use the number pad for the numbers and hit Down Arrow every time I wanted to enter the number and move on to the next cell. Unfortunately, when the number pad is working like a number pad, the Down Arrow key types a 2 instead of moving the cursor. Stymied.

There is a nonmacro solution: get into number pad mode with NumLock. Use the number pad for numbers and hit Enter every time a number is complete. Then, without using NumLock to get out of number pad mode, hit Shift-2 (Down Arrow). The Shift key temporarily gets you

back to cursor movement mode. After you've moved down one cell, get off the Shift key and enter another number at the number pad.

That solution is fine as far as it goes, but I still get confused, so I use the following macro:

```
\N      {?} {down}  
        /xgN
```

Type in this macro. Now get into number pad mode and run the macro with Alt-N. Type a number at the number pad and hit Enter. The number will go into the cell and the cursor will move down one row. Type another number, hit Enter, and it will do it again. Hitting Enter will now both complete the cell entry and move the cursor. Problem solved.

This macro uses {?}, which makes a macro wait until you hit Enter. Once you've done that, the macro executes the {down} command, and with the /xg command loops back to the beginning of the macro. This is yet another endless loop, so use Ctrl-Break to stop it.

If you want to enter numbers along a row, just change the {down} in the macro to {right}. —Jared Taylor

go off and do its work, stopping when finished. And most fumbling with Ctrl-Break.

Since this is starting to become a semi-sophisticated macro, I have included what programmers call "comments" in column E. These are short descriptions of what each line of the macro does. Although I wrote this macro, if I wanted to modify it next month, I might not remember how it works, and the comments would refresh my memory. Just remember to keep comments in a separate column from the macro instructions. If they are in the same cell, 1-2-3 will think they are more macro instructions and try to process them.

How does this macro work? The first line is the same as in Figure 3; it asks you how wide the columns should be and stores your answer in BLANK. The next

line operates on much the same principle, but it uses a different /x command. This one is /xn, and in this case, n stands for number. It displays the message "How many times?" just as /xl does and stores your answer in a cell—this time in cell C12, which has the name TOTAL. Your answer is the number of columns you want set to the specified width.

The difference between the two commands is that /xl stores your answer as a label and /xn stores it as a number. The one to choose depends on how your answer has to be used. The /xl in the first line may be confusing because, after all, the answer you give is the number of characters for the column width. You might think you'd need the /xn command. The reason the /xn command won't work at that point is because when 1-2-3 gets to the cell named BLANK, it is

■ PC LAB NOTES

looking for characters to type as part of the column-width command. It doesn't do anything arithmetic with them at all, since it's looking for characters that are a label, even though they happen to be numbers. This is logical, even though it sounds confusing. For example, try using /xn in the first line of the macro and watch it not work. You can use /xn in the second line because your answer to the prompt will be treated like a number.

Cell C3, along with cell C8, is what makes the macro stop after it has set the width for as many columns as you told it to. It uses another /x command, and the "i" stands for If-Then. Its general format is

```
/xicondition" . . .
```

where *condition* is something you check to see whether it's true or false. The dots

■ You can have many instructions in a cell or just one. 1-2-3 reads what's in the cell and moves on to the next cell.

that follow mean that further macro instructions appear in the same cell. If the condition is true, 1-2-3 processes those instructions. If the condition is false, 1-2-3 ignores the rest of the instructions in that cell and moves to the cell below.

The condition we check in this macro is whether the value in TOTAL is equal to zero. TOTAL, you remember, is the number of columns you told the macro to set the width for when you answered the prompt in the second line. Only when 1-2-3 recognizes the condition TOTAL = 0 to be true will it go on to process the rest of the instructions in that cell—namely, /xq. We'll get back to that.

When the macro begins executing, the value of TOTAL won't be zero as long as you answered the "How many times?" prompt with a number greater than zero. The /xi condition will therefore be false, and 1-2-3 will jump down to C4. There it

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■ PC LAB NOTES

finds our familiar old column-width command and processes the cells C4 through C7 just the way it did in the macro in Figure 3.

Now we get to cell C8. These instructions use the /Data Fill command in a slightly unorthodox way to decrease the value of TOTAL by 1. Whatever TOTAL's value is, whenever I-2-3 processes the instructions in C8, TOTAL will decrease by 1. Play around with the /Data Fill command and figure out how C8 works. The beauty of this instruction is that each time the macro sets a column width, the next thing it does is reduce the value of TOTAL by 1, thereby bringing it one step closer to zero.

Cell C9 makes the macro loop back to the cell named TEST where, once again, I-2-3 checks to see if TOTAL = 0. If that condition still isn't true, the macro goes on setting column widths and reducing the value of TOTAL.

Only after the macro has set the width for as many columns as you told it to will the condition TOTAL = 0 be true. Now I-2-3 will finally process what follows the tilde in cell C3 and end the macro. That /xq is just another /x command, and the letter q stands for quit. It brings the macro to a halt even though there are instructions in the cell below. That's its job—to stop a macro no matter what. It's a little like Ctrl-Break, except that it returns you cleanly to ready mode without an error message.

GETTING BETTER The macro in Figure 4 is not one you're likely to write on your first day of experimentation. But it does give you an idea of some things macros can do. And they can do much, much more. You can write macros that draw graphs, do database operations, consolidate spreadsheets, and create custom menus that work just like I-2-3's own built-in menus. There is no limit to the variety of jobs macros can do, and people who know nothing about computers or programming invent macros everyday. (For tips on keeping track of your macros and circumventing Lotus's restriction on how many you can have, see sidebar "Macros Unlimited.") Once you start using macros, you'll wonder how you got along without them.

WHERE TO TURN FOR MACRO INSTRUCTION

Information on writing, using, and debugging macros is available in many formats, including books, video-cassettes, and teaching systems.

The books below can be used by beginners as well as advanced macro users. They cover topics ranging from the fun-

damentals of creating a macro to extensive listings of usable, prewritten macros.—Christopher Barr

Christopher Barr wrote "I-2-3 Learning Aids: Many Paths to Proficiency" (PC Magazine, Volume 5 Number 15).



FACT FILE

The Lotus Guide to Learning I-2-3

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Daniel Shaffer
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Prentice-Hall Inc.
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The Hidden Power of Lotus I-2-3: Using

Macros
Mark Williams and Richard Riddington
\$19.95
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Prentice-Hall Inc.
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The best way to learn how to write macros is to write macros. Trial and error is the best teacher, but you'll be way ahead of the game if you read the sections in the I-2-3 manual about macros. If the manual's description of a macro command sounds interesting to you, fiddle with the command until you understand how it works.

Don't be timid, either, about using other people's good ideas. Everybody does it, and most folks are happy to share a good thing. That's what Spreadsheet Clinic in this magazine is all about.

But most important, don't forget that macros, just like spreadsheets, can be as

complex or as simple as you like. If anything more than a three-line macro bores you, stick to short ones. My favorite macro (see sidebar) is only two lines long, and it could be rewritten onto a single line. I-2-3 can be tremendously productive even if you don't use every (a function, and macros can be tremendously helpful even if they're not huge (see sidebar "Where to Turn for Macro Instruction"). Stick to your own pace, and do what works best for you.

Jared Taylor, a contributing editor of PC Magazine, writes the *Spreadsheet Clinic* column.

■ PROGRAMMING/UTILITIES ■ STEVE HOLZNER

BEAT THE BEEPS WITH VISITYPE



If your keyboard pounding runs ahead of DOS's 15-character typeahead limit, here's an 80-character visible buffer that even lets you make corrections.

This is the kind of utility you'll either use several times an hour or wonder why anyone would ever need it at all. If you're the kind of PC user who waits for DOS to finish what it's doing before you start typing in your next command, chances are you've never even heard the shrill, insistent beeps with which DOS signals that you've exceeded the 15-character limit of its keyboard typeahead buffer. On the other hand, if your fingers are always busy entering new commands while DOS scrolls through long directory listings or Norton's FILEFIND tracks down all your *.TMP files, there's not much you wouldn't do (short of changing your typing habits) to avoid those raucous protests.

VISIBLE TYPEHEAD If you're in this latter group and find the PC's 15-character typeahead buffer less than adequate, you'll appreciate the 80-character buffer that VISITYPE provides. At the same time, although the idea of a king-size typeahead buffer sounds attractive, what if you make a mistake on your 17th keystroke? How many characters have you typed, and what are they? Even using the limited DOS buffer is a little like throwing keystrokes into the void. To make full use of a large typeahead buffer you simply must be able to see—and even correct—what you're typing.

That's what VISITYPE is all about. It's memory resident, so all you have to do is enter the command name once (your AUTOEXEC.BAT file is a good place) and the program remains active until you power-down or hit Ctrl-Alt-Del. No in-

structions are necessary: as soon as you type more than one character ahead of the display, the keyboard buffer, now increased to 80 characters, appears at the top of the screen, where it stays until the buff-

ered characters are read. This line is displayed with the same screen attribute you've been using, even if your passion is for blinking red on yellow. As the buffer empties (and you can watch the characters

```

VECTORS SEGMENT AT $H          ;Set up segment to intercept Interrupts
        DDQ 9B*4                ;The keyboard Interrupt
        LABEL WORD
KEYBOARD_INT ORG 1CB*4          ;Timer Interrupt
        LABEL WORD
TIMER_VECTOR VECTORS ENDS

SCREEN SEGMENT AT $D800H        ;A dummy segment to use as the
        ENDS                    ;Extra Segment

RDM_BIDS_DATA SEGMENT AT 40B     ;BIDS at address held here, also keyboard buffer
        ORG 1AH
        HEAD DB 7                ;Unread char go from Head to Tail
        TAIL DB 7
        BUFFER DB 16 DUP (?)    ;The buffer itself
        BUFFER_END LABEL WORD

RDM_BIDS_DATA ENDS

CODE_SEG SEGMENT
        ASSUME CS:CODE_SEG
        ORG 100H
FIRST: JMP LOAD_BUFFER          ;DRG = 100H to make this into a .COM file
                                ;First time through

        COPY_RIGHT DB 'Copyright 1986 Siff-Davis Publishing Co.'
        BUFF DB 0
        BUFF2 DB 159 DUP(0)
        PAD_OFFSET DB 0
        SCREEN_SEG_OFFSET DB 0
        TO_CHAR DB 1
        OLD_HEAD DB 1
        DISPLAY_ON DB 0
        STATUS_PORT DB 0
        NEAR_ATTR_FLAG DB 0
        OLD_KEYBOARD_INT_LABEL LABEL DWORD
        OLD_KEYBOARD_INT DB 0
        RDM_TIMER_LABEL LABEL DWORD
        RDM_TIMER DB 0
                                ;The Timer interrupt's address

BUFSTUFF PROC NEAR
        ASSUME CS:CODE_SEG
        PUSH AX
        PUSH BX
        PUSH CX
        PUSH DX
        PUSH DI
        PUSH SI
        PUSH DS
        PUSH ES
                                ;The keyboard interrupt will now come here.
                                ;Save the used registers for good form

```

(continues)

Figure 1: The assembly language listing for VISITYPE.COM.

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slide to the left as it does), the top line of the screen is restored and your typed-ahead keystrokes appear at the normal prompt. You can even delete characters with the Backspace ("rubout") key while they're in the type-ahead buffer—something else you can't do with the standard DOS keyboard buffer. And no more ridiculous beeps when you enter more than 15 keystrokes.

VISITYPE does all this without disturbing the programs you are running. It

reads keys directly from the keyboard buffer, stores them in its own memory space, and puts them directly on the screen by writing directly to the screen buffer.

GETTING VISITYPE Instructions on downloading a copy of VISITYPE by modem, for assembling it from the source listing shown in Figure 1, and for creating it from the BASIC listing shown in Figure 2 are contained in the sidebar "Downloading VISITYPE." If you're

```

PUSHP      OLD_KEYBOARDO_INT_LABEL
CALL       DS:ROM_BIOS_DATA
MOV        BX,ROM_BIOS_DATA
MOV        DS,BX
MOV        BX,TAIL
CHK        BX,HEAD
JNE        CONT
JMP        OUT
CONT:      MOV        DX,TAIL
SUB        DX,2
CHK        CX,OFFSET BUFFER
JAE        NOWRAP
MOV        BX,DX
NOWRAP:    MOV        CX,[BX]
CHK        CX,BUFF
JNE        T10
MOV        BX,HEAD
CHK        BX,OLD_HEAD
JLE        T11
T10:      CMP        BUFF,0
JNE        REMOVE
T11:      CMP        CX,HEAD
JNE        REMOVE
JMP        OUT
REMOVE:    ;More than one char in buffer —
            MOV        BX,DX
            MOV        DX,[BX]
            MOV        CX,0
            MOV        BX,0
CHECK:     CMP        BUFF[BX],0
            JE         ADD_LOOP
            ADD        LOOP
            CMP        JNE
            MOV        PTR BUFF[BX],0
            MOV        BX,HEAD
            MOV        OLD_HEAD,BX
            MOV        CX,[BX]
            MOV        BX,DX
            JMP        OUT
BUFFNO:    CMP        CX,#FFFF
            JNE        MODEL
OEL:      SUB        BX,2
            CMP        BX,#FFFF
            JLE        JNE
            MOV        PASCAL
            MOV        CX,TAIL
            MOV        HEAD,BX
            MOV        BUFF,0
            JMP        SHORT CHRDIS
FADDEL:    MOV        CX,0
MODEL:     MOV        BUFF2[BX],CX
            MOV        BX,HEAD
            MOV        OLD_HEAD,BX
            MOV        CX,[BX]
            MOV        BUFF,CX
CHRDIS:    CMP        DISPLAY_CN,0
            JNE        FLASH
            MOV        DISPLAY_CN,0
            MOV        PAO_OFFSET,160
            LEA        AX,GET_CHAR
            MOV        IO_CHAR,AX
;First, call old keyboard interrupt
;Examine the char just put in
;Point to current tail
;If et head, kbd int has deleted char
;So leave
;Read a char — head advances.
;Point to just read in character
;Did we undershoot buffer?
;Hope
;Yes — move to buffer top
;Get key in CX
;Is it where we were before?
;Yes the head moved?
;If yes, we have moved.
;If there's something in BUFF2,
;remove char in kbd buffer.
;Do nothing this pass.
;Remove One!
;Remove character by adjusting tail.
;Store character in buffer.
;Find end of visitype buffer.
;Was this key a rubout?
;No, and buffer filled — leave.
;Yes, buff full but rubout last char.
;Store this for next time.
;Always load BUFF.
;Can't hold more than 255!
;Rubout (and buffer not full)?
;No, don't del.
;Yes, delete last key.
;Gone too far?
;Del the one char in kbd buffer
;by making tail = head.
;CX --> 0 if we are deleting.
;load key in Visitype buffer.
;And store the old head to check later.
;Always reload BUFF.
;Are we on?
;Yes, call OISPLAY
;Store what's on the screen first.
;Make IO use Get-Chr so it does.

```

(Figure 1 continues)

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organizes it is common to all circular buffers. When you type a character, it is stored in one of these words. The word that receives the next character is called the tail. After a key is stored in the tail word, the next word in line becomes the tail. Thus, the tail is always the memory location where the next key typed at the keyboard will be stored.

On the other hand, when DOS reads a character or key from the keyboard buffer, the head advances. The head is simply the name given to the word that is next in line to be read. Once DOS reads a character, the next word becomes the head, until

DOS reads enough characters to make the head catch up with and overlap the tail. When this happens, the buffer is empty. You can think of the keyboard buffer as a circular loop in which the head forever chases the tail.

When the keyboard buffer reads a key, the tail advances one word. If DOS does not read any keys to advance the head, the tail will eventually come up right behind the head. It cannot overlap (that is, become the same word as) the head, since that indicates an empty buffer. The buffer is full, then, when the tail is right behind the head; the tail word is always kept empty. This is

```

DEC      S1                ;Decrement loop counter
JNE      P_WAIT_LOW       ;if not zero, do it one more time
ADD      BX,2
POP      DX
STI
RET      ;Exit

PUT_CHAR      ENDP

ID          PROC          ;This scans over screen positions on top line.
ASSUME     ES:SCREEN      ;Use screen as extra segment
MOV        BX,SCREEN
MOV        ES,BX
MOV        DI,SCREEN_SEG_OFFSET ;DI will be pointer to screen position
MOV        BX,DX+DPSET    ;BX will be location pointer
MOV        CX,00

CHAR_LOOP   CALL          ;Call Put-Char or Get-Char
           LOOP           ;if not zero, scan over next character
           RET            ;finished

IO          ENDP

INTERCEPT_TIMER  PROC  NEAR
;IF NO KEYS IN BUFFER, PUT NEXT ONE IN.
PUSH      DS
PUSH      CS
PUSH      DS
PUSHF
CALL      ROM_TIMER_LABEL
CMP        SI,0
JNE        GO
JMP        OUT1

GO:        CLT
PUSH      ES
PUSH      DS
PUSH      SI
PUSH      DS
PUSH      DI
PUSH      DX
PUSH      CX
PUSH      BX
PUSH      AX
ASSUME     DS:ROM_BIOS_DATA
MOV        AX,ROM_BIOS_DATA
MOV        DS,AX
MOV        BX,TAIL
CMP        BX,0
JNE        FINISHUP
;Get the char to put in kbd buffer.
MOV        CX,79
MOV        BX,0
MOV        DX,BUFF[BX*2]
;Do this word by word.
ADD        BX,2
INC        SI
SLD        SI
MOV        WORD PTR DUFF2[BX-2],S
;Stores this to check if user is typing
;while we drain buffer.
MOV        DX,TAIL
MOV        ADD        DX,2
CMP        DX,DPSET+BUFFER_END
JL         NO_WRAP
MOV        DX,DPSET+BUFFER

```

(Figure 1 continues)

why only 15 keys can be accepted in the keyboard buffer, although there are 16 words in it. As soon as you try to type more than 15 characters, the tail cannot advance, and you get a petulant protest that informs you the buffer is full.

ASCII AND SCAN CODES Each letter or number that appears on the screen is represented internally by an ASCII code. For example, the ASCII code for A is 65. The PC can produce 256 different characters on the screen, each of which can be represented by 1 byte. This is in fact the way ASCII is stored—byte by byte. Why, then, is a

full word—2 bytes—required to hold a single character in the keyboard buffer?

The answer is that the signal that is read from the microprocessor in the keyboard is not simply the character's ASCII code but, rather, a so-called scan code. There is a different scan code for each of the 83 keys on the PC's keyboard. The PC also keeps track of just what keys are pressed down (so it can give you typematic repeat when you keep a key pressed down). For this purpose, the keyboard sends the character's scan code when the key is first pressed, and the same scan code plus 128 when the key is released. The reason the

```
NO_WRAP: CNP      DX, READ
              JS      FIRSTUFF
              MOV     BX, TAIL
              MOV     (BX), AX
              MOV     TAIL, DX
              MOV     BUFP2, 0
              JNB     DIF
              MOV     BUFP, 0
              MOV     DISPLAY_ON, 0
              MOV     PAD_OFFSET, 168
              LEA     AX, PUT_CHAR
              MOV     IO_CHAR, AX
              MOV     NEAR_ATTRIB_FLAG, $FFH
              CALL    TO
              JMP     SHORT ODIS
DIS:         CALL   DISPLAY
ODIS:        POP     AX
              POP     CX
              POP     CX
              POP     DX
              POP     DI
              POP     SI
              POP     DS
              POP     ES
              IRET    DS
              INTERCEPT_TIMER  ENDP

LOAD_BUFFER  PROC      NEAR
              ASSUME    DS:VECTORS
              MOV     AX, VECTORS
              MOV     DS, AX
              MOV     AX, KEYBOARD_INT
              MOV     OLD_KEYBOARD_INT, AX
              MOV     AX, KEYBOARD_INT[2]
              MOV     OLD_KEYBOARD_INT[2], AX
              MOV     KEYBOARD_INT_OFFSET BUFPUFF
              MOV     KEYBOARD_INT[2], CS
              MOV     AX, TIMER_VECTOR
              MOV     ROM_TIMER, AX
              MOV     AX, TIMER_VECTOR[2]
              MOV     ROM_TIMER[2], AX
              MOV     TIMER_VECTOR_OFFSET INTERCEPT_TIMER
              MOV     TIMER_VECTOR[2], CS
              ASSUME    DS:ROM_BIOS_DATA
              MOV     DS, AX
              MOV     RX_OFFSET BUFFER
              MOV     READ, BX
              MOV     OLD_READ, BX
              MOV     TAIL, BX
              MOV     AH, 15
              INT     15H
              MOV     STATUS_PORT, $3BAH
              TRST    AL, 4
              JBE     EXIT
              MOV     SCREEN_SEG_OFFSET, $0000
              MOV     STATUS_PORT, $3DAH
              MOV     DX, OFFSET LOAD_BUFFER
              INT     27H
              LOAD_BUFFER  ENDP
              CODE_SEG     ENDS
              END          FIRST
              ;END "FIRST" so $0000 will go to FIRST first.
```

(Figure 1 ends)

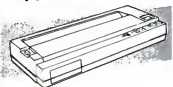
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■ PROGRAMMING/UTILITIES

■ The keyboard buffer is a circular loop in which the head forever chases the tail.

keyboard buffer provides 2 bytes for each typed key is that the 2nd byte is the key's scan code. When a key is typed, the PC stops whatever it is engaged in and reads in the scan code from the keyboard port. An internal routine then figures out what the struck key's ASCII code is from its scan code, and both are then put into the keyboard buffer.

What VISITYPE does is watch the keyboard buffer. Every time a key is struck, VISITYPE checks to see if the last key that was typed has already been read. If so, you're not ahead of DOS. If not, VISITYPE takes the just-struck key's scan and ASCII codes out of the buffer, carefully moves the buffer's tail (where the next character will be stored) back one word, and stores the character in its own 80-word buffer.

On the other side, VISITYPE must also watch the keyboard buffer so that it can tell when keys are being read. Every time VISITYPE's internal buffer is not empty and a key is read from the keyboard buffer, VISITYPE slides its 80-word buffer over by one and puts another character into the keyboard buffer. This is the process you see on your screen when the characters you've typed ahead slide over to the left as the PC reads them.

VISITYPE is actually more complex in action than I just described. What happens, for example, if the PC is reading from the 80-word VISITYPE buffer and you start typing something else? VISITYPE must be smart enough to take what you're typing from the keyboard buffer and move it to the end of its own buffer so that nothing gets read out of turn. Further, VISITYPE must watch for Backspace (rubout) characters and delete the last key in its buffer—as long, that is, as there are any characters left in the

```
100 REM -- BASIC PROGRAM TO CREATE visitype.COM
110 OPEN "visitype.COM" AS #1 LEN = 1
120 FIELD #1:1 AS A$
130 CHECKSUM = 0
140 FOR I% = 1 TO 134
150   LINESUM% = 0
160   FOR J% = 1 TO 8
170     READ BYTE%
180     CHECKSUM = CHECKSUM + BYTE%
190     LINESUM% = LINESUM% + BYTE%
200     IF (BYTE% < 256) THEN GOSUB 250
210   PUT #1
220 NEXT J%
230 READ LINECHECK%
240 IF LINECHECK% <> LINESUM% THEN PRINT "Error in Line";200 + 10 * I%
250 NEXT I%
260 CLOSE
270 IF CHECKSUM = 61337 THEN PRINT "Successful Completion!" : END
280 PRINT "COM file is not valid!": END

290 DATA 233, 151, 3, 67, 111, 112, 121, 114, 552
300 DATA 105, 103, 104, 116, 32, 49, 57, 56, 622
310 DATA 54, 32, 58, 105, 102, 102, 45, 60, 590
320 DATA 97, 110, 105, 115, 32, 58, 117, 98, 762
330 DATA 100, 105, 115, 104, 105, 110, 103, 32, 782
340 DATA 67, 111, 46, 0, 0, 0, 0, 0, 224
350 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
360 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
370 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
380 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
390 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
400 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
410 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
420 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
430 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
440 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
450 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
460 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
470 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
480 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
490 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
500 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
510 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
520 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
530 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
540 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
550 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
560 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
570 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
580 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
590 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
600 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
610 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
620 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
630 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
640 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
650 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
660 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
670 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
680 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
690 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
700 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
710 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
720 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
730 DATA 0, 0, 0, 0, 0, 0, 0, 0, 0
740 DATA 0, 0, 0, 0, 0, 0, 0, 0, 1
750 DATA 0, 1, 0, 0, 0, 0, 0, 0, 1
760 DATA 0, 0, 0, 0, 0, 0, 0, 0, 88
770 DATA 83, 81, 82, 87, 86, 30, 6, 156, 611
780 DATA 46, 255, 30, 115, 2, 187, 64, 8, 703
790 DATA 142, 219, 139, 30, 30, 59, 30, 647
800 DATA 26, 0, 117, 3, 233, 212, 0, 139, 730
810 DATA 22, 20, 0, 131, 234, 2, 129, 250, 796
820 DATA 30, 0, 115, 6, 106, 62, 0, 131, 530
830 DATA 234, 2, 139, 218, 139, 15, 46, 59, 807
840 DATA 14, 43, 1, 117, 11, 139, 30, 26, 301
850 DATA 0, 46, 59, 30, 113, 2, 116, 0, 374
```

(continues)

Figure 2: A BASIC program that will create VISITYPE.COM.

VISITYPE buffer to rub out.

Since VISITYPE works directly with the keyboard and video buffers, it shouldn't disturb any but the most finicky programs. If the programs you run use the

standard DOS routines to read from the keyboard buffer, everything should be fine. In fact, even if your program reads directly from the keyboard buffer, VISITYPE is still designed to work in as

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870 DATA	59,	22,	26,	0,	117,	3,	233,	154,	614
880 DATA	0,	139,	218,	137,	22,	28,	0,	139,	603
890 DATA	13,	185,	48,	0,	187,	0,	0,	46,	521
900 DATA	131,	191,	45,	1,	0,	116,	40,	131,	655
910 DATA	195,	2,	226,	243,	129,	250,	0,	14,	1067
920 DATA	117,	121,	107,	156,	0,	439,	135,	563	563
930 DATA	43,	1,	0,	0,	139,	38,	26,	0,	239
940 DATA	46,	137,	38,	113,	2,	139,	23,	46,	536
950 DATA	137,	22,	43,	1,	235,	93,	144,	129,	804
960 DATA	250,	158,	0,	117,	38,	131,	235,	787	787
970 DATA	131,	251,	254,	124,	76,	117,	37,	139,	1111
980 DATA	14,	28,	0,	137,	14,	26,	0,	46,	265
990 DATA	199,	6,	43,	1,	0,	0,	235,	24,	508
1000 DATA	186,	0,	0,	46,	137,	151,	45,	546	546
1010 DATA	139,	30,	26,	0,	46,	137,	30,	113,	521
1020 DATA	2,	139,	23,	46,	137,	22,	43,	1,	413
1030 DATA	46,	128,	62,	115,	2,	0,	117,	24,	494
1040 DATA	46,	190,	6,	115,	2,	255,	46,	199,	867
1050 DATA	6,	107,	2,	160,	0,	141,	6,	151,	573
1060 DATA	3,	46,	163,	111,	2,	232,	136,	0,	693
1070 DATA	232,	9,	0,	7,	31,	94,	95,	98,	558
1080 DATA	189,	91,	98,	207,	80,	46,	190,	62,	805
1090 DATA	118,	2,	0,	46,	199,	6,	107,	2,	480
1100 DATA	0,	0,	141,	6,	192,	3,	46,	163,	551
1110 DATA	111,	2,	232,	99,	0,	88,	195,	82,	889
1120 DATA	198,	2,	0,	46,	137,	22,	135,	2,	1170
1130 DATA	236,	168,	1,	117,	251,	216,	168,	1,	1170
1140 DATA	116,	251,	30,	139,	5,	71,	78,	131,	829
1150 DATA	254,	0,	116,	7,	46,	137,	135,	43,	738
1160 DATA	1,	235,	207,	131,	195,	2,	98,	139,	809
1170 DATA	62,	250,	46,	138,	167,	43,	1,	190,	917
1180 DATA	2,	0,	46,	139,	22,	116,	2,	236,	563
1190 DATA	166,	1,	117,	251,	236,	168,	1,	116,	1058
1200 DATA	251,	38,	138,	37,	46,	138,	167,	546	546
1210 DATA	1,	46,	128,	62,	118,	2,	0,	117,	474
1220 DATA	5,	46,	138,	167,	204,	1,	71,	78,	710
1230 DATA	117,	221,	131,	195,	2,	98,	251,	195,	1282
1240 DATA	167,	0,	176,	142,	195,	46,	139,	62,	805
1250 DATA	189,	2,	46,	139,	38,	107,	2,	105,	620
1260 DATA	80,	0,	46,	255,	22,	111,	2,	226,	742
1270 DATA	249,	195,	38,	14,	31,	156,	255,	38,	969
1280 DATA	123,	0,	131,	142,	62,	45,	1,	181,	821
1290 DATA	3,	237,	156,	6,	250,	6,	38,	86,	764
1300 DATA	87,	82,	81,	83,	80,	184,	64,	0,	661
1310 DATA	142,	216,	139,	38,	20,	0,	57,	38,	642
1320 DATA	26,	0,	117,	14,	46,	161,	45,	478,	478
1330 DATA	146,	79,	0,	187,	0,	0,	139,	136,	616
1340 DATA	151,	45,	1,	46,	137,	151,	43,	1,	575
1350 DATA	131,	195,	2,	70,	226,	248,	46,	199,	1189
1360 DATA	135,	43,	1,	0,	139,	22,	26,	366	366
1370 DATA	186,	46,	137,	22,	113,	22,	119,	22,	481
1380 DATA	28,	0,	131,	194,	2,	129,	250,	62,	796
1390 DATA	0,	124,	3,	108,	38,	0,	59,	22,	424
1400 DATA	26,	0,	116,	18,	139,	38,	28,	0,	349
1410 DATA	137,	7,	137,	22,	28,	0,	46,	131,	508
1420 DATA	62,	45,	1,	0,	117,	39,	46,	199,	509
1430 DATA	6,	43,	1,	0,	0,	46,	138,	6,	309
1440 DATA	115,	2,	0,	46,	199,	6,	187,	2,	477
1450 DATA	160,	0,	141,	6,	192,	3,	46,	163,	711
1460 DATA	111,	2,	46,	190,	6,	118,	2,	255,	730
1470 DATA	232,	69,	255,	235,	3,	232,	196,	254,	1478
1480 DATA	180,	91,	99,	98,	95,	94,	31,	7,	585
1490 DATA	31,	207,	184,	0,	8,	142,	216,	161,	941
1500 DATA	36,	0,	46,	163,	119,	2,	161,	38,	565
1510 DATA	0,	46,	163,	121,	2,	199,	6,	36,	573
1520 DATA	0,	127,	2,	46,	14,	38,	0,	161,	481
1530 DATA	112,	0,	46,	163,	123,	2,	161,	114,	721
1540 DATA	0,	46,	163,	125,	2,	199,	6,	112,	653
1550 DATA	0,	18,	6,	140,	14,	114,	0,	184,	474
1560 DATA	46,	124,	107,	137,	30,	0,	137,	716	716
1570 DATA	30,	26,	0,	46,	137,	38,	113,	2,	384
1580 DATA	137,	38,	28,	0,	180,	15,	205,	16,	611
1590 DATA	46,	199,	6,	116,	2,	186,	3,	168,	726
1600 DATA	6,	117,	14,	46,	199,	6,	0,	497	497
1610 DATA	0,	128,	46,	199,	6,	116,	2,	218,	715
1620 DATA	3,	188,	194,	4,	205,	39,	0,	0,	631

(Figure 2 ends)

many cases as possible. There are programs, however, that will entirely take over the keyboard buffer and keep dummy words in it, and you can't do much with that type of programming. [When Xy-Write III's XYKBD.COM is loaded in front of VISATYPE, the keyboard buffer is

expanded, all right, but the contents of the VISATYPE buffer are not displayed.—Ed.]

The keyboard buffer is just half the story, though. The other half is the visible typehead on the screen, which must appear on the screen without bothering, let alone crashing, any program then running.

■ PROGRAMMING/UTILITIES

■ The visible typeahead appears on the screen without bothering, let alone crashing, any program then running. It does this by writing to the video buffer.

The way it does this is by writing directly to the video, or screen, buffer.

THE SCREEN BUFFER The characters you see on the screen are stored in memory in the screen buffer. Periodically, this area of memory is scanned by the video controller chip. It reads what characters are there and coordinates their display on the screen. To write to the screen, on the assembly language level, all a program has to do is deposit bytes in the screen buffer. In fact, each character takes 2 bytes here, too. One byte, as in the keyboard buffer, is the character's ASCII code. The other byte is the character's screen attribute. In other words, one byte (the ASCII code) tells the PC *what* to display and the other byte (the attribute byte) tells it *how* to display it. Different attributes have different meanings for different types of screens. For example, a color-graphics screen can display yellow on blue, while a monochrome screen cannot.

You can use DEBUG (which comes with DOS) to write directly to the screen buffer yourself. To see how this works, simply enter the short program shown below. The attribute I've chosen for the message you will produce on the screen is reverse video blinking. If you have a color-graphics screen, start by entering the command EB800:0860, as shown; if you have a monochrome screen, use EB000:0860, instead. Simply type in all the hex numbers, putting a space between each. (DEBUG will provide carriage returns when you come to the end of a line, so don't en-

Downloading VISITYPE

The programs that appear in our Programming/Utilities column (as well as other programs we publish) can be downloaded by modem from the PC Magazine Interactive Reader Service. There is no charge for this service, but users are cautioned that these programs are copyright material and are made available only for individual, noncommercial use. Making copies for others (including placement on other electronic bulletin boards), with or without charge, is a violation of the Ziff-Davis copyright.

The modem number for PC-IRS is (212) 696-0360. Set your modem and communications software to use 1200 (or 300) baud, 8 data bits, 1 stop bit, no parity. PC-IRS files with a .COM, .EXE, or

.ARC extension require that you also use the Xmodem error-checking protocol; our other files (e.g., with extensions of .ASM or .BAS) can be downloaded using either regular ASCII or Xmodem transmission.

VISITYPE.BAS, whether typed in from the magazine at your keyboard or downloaded from PC-IRS, will automatically create VISITYPE.COM when run once in BASIC. VISITYPE.ASM, also listed both here and on PC-IRS, allows you to modify the program but requires that you use a macro assembler (IBM or Microsoft) and the following commands:

```
NASM VISITYPE;  
LINK VISITYPE;  
EXE2BIN VISITYPE VISITYPE.COM
```

VISITYPE at a Glance

Syntax:

```
[d:] [path]VISITYPE
```

Operation: VISITYPE is a memory-resident utility that creates an 80-character typeahead buffer whose contents, until scrolled into the DOS keyboard

buffer, appear on the topmost line of the screen. Keystrokes are stored in the VISITYPE buffer and can be deleted with the Backspace key.

Note: VISITYPE is normally loaded via your AUTOEXEC.BAT file.

—Craig L. Stark

ter any between the numbers.) When you have finished typing in the whole set of numbers, type a carriage return yourself, as shown, to get out of DEBUG's edit mode.

```
ASCII  
ADDRESS  
HEX  
01 7F 4F 7F 0F 2F 6F 8F 5F 7F 0F 7F 5F 6F 4F 7F -C3-
```

After you type EB800:0860, DEBUG will show you what the value currently in memory at that address is—something like 20. Just type in the first hex value (47), followed by a space, and keep going until all the hex values are typed. If you now look at the screen, you'll see a flashing message to reward your patience.

When you put bytes into the screen buffer via DEBUG, the video controller reads them and puts them on the screen. The key is that anybody—any program,

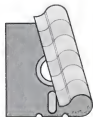
including VISITYPE—is free to put bytes into the screen buffer. Since VISITYPE attaches itself to DOS when first run, it stays in memory and is in a position to put what it wants into the screen buffer, providing it is smart enough to know whether you're using a color-graphics or monochrome screen. When it does, all it is doing is changing some memory locations, and as long as it doesn't touch the main program then running, there will be no interference. Utilities that pop up on your screen work the same way. When VISITYPE is done, it restores the top line of the screen again.

And that's all there is to VISITYPE. Give it a try, and take your new keyboard buffer out for a spin. You may never type the same way again.

Steve Holzner is a contributing editor of PC Magazine.

■ JARED TAYLOR

SPREADSHEET CLINIC



Beating the 240-character limit, Bottom Up for Bottom Down, and a sophisticated search-and-replace function highlight these 1-2-3 tips.

DATE CONVERSIONS

In your column of May 13 (Volume 5 Number 9), you ran a submission from a reader who uses a macro to change 1-2-3 date formats from the rather informal 15-Mar-86 to the more formal March 15, 1986. In Release 2.0 and *Symphony*, the same thing can be done without resorting to a macro. Figure 1 shows the formulas that will do the job; for clarity, I've broken them up into three parts. The operative cells are E6, E8, E10, and E12; their contents are shown as labels in column D. Cell E12 is nothing more than a concatenation of the contents of E6 through E10.

The *(t* month function in E6 returns today's month as a number. The *@vlookup* searches the MONTH_TABLE in cells F5..G16 to give the proper label, which is the name of the month. The *&" "* adds a space to the month name so that the final concatenation in cell E12 will have the proper appearance. Cells E8 and E10 return string values for the day of the month and the year. The *,0* in both formulas ensures that there are no decimal places, and the characters between quotation marks insert a comma and space between the numbers and add 19 to the year numerals. A concatenation of all three cells gives the results in E10.

Obviously the formulas in cells E6 through E10 can be combined in a single formula and put anywhere you would like today's date to appear. The month table can be tucked somewhere safely out of the way.

Al Antonson
Jackson, New Jersey

GETTING TO THE BOTTOM OF THINGS

When it is necessary to get to the bottom of a column, I frequently see 1-2-3 macros used in Spreadsheet Clinic submissions. The usual solution is to include the following commands:

```
{end}{down}
```

with the warning that this will work only if the column in question does not contain blank cells.

A more reliable method is to go to the lowest possible point in the spreadsheet, row 8192, and then find the first nonempty cell up from there. Figure 2, macro \C,

shows how to get there.

Susan Benac
Severna Park, Maryland

I have used this technique to write a macro (\P in Figure 2) that will print most spreadsheets of unknown size. As has been noted in submissions to this column, using {end}{home} to establish a print range may not work because previously deleted cells, formatted cells, and other junk will influence where the cursor ends up. This print macro will work only if the last row of the spreadsheet—located by the first two lines of the macro—is as wide as the widest row in the whole spreadsheet.

	D	E	F	G
3	DATE CONVERSION			MONTH_TABLE
4				
5				
6	=VLOOKUP(MONTH(ENOW),MONTH_TABLE,1)&" "	July	1	January
7			2	February
8	=RSTRING(ENOW(ENOW),0)&" "	28,	3	March
9			4	April
10	=*19"&RSTRING(EYEAR(ENOW),0)	1986	5	May
11			6	June
12	=C4&C6&C8 WILL YIELD --->	July 28, 1986	7	July
13			8	August
14			9	September
15			10	October
16			11	November
			12	December

Figure 1: A series of formulas that will give today's date in formal notation.

\C	{goto}e8192" {end}{up}
\P	{goto}e8192" {end}{up} {recalc} curcell} {goto}
CURCELL	+{r}*RSTRING(@CELLPOINTER("row",0) -{end}{left} /{ppr}{be}.{home}"gg

Figure 2: A macro that takes you to the bottom of a column, and a print macro that uses the same technique.

■ SPREADSHEET CLINIC

SEARCH AND REPLACE

The macro in Figure 3, written for 1-2-3, Release 2.0, deletes all occurrences of a string and gives you the option of replacing them with something else. To run it, just put the cursor on the cell you want to work with and hit Alt-A. The macro prompts you for the string to delete and then for the string to insert. If you want only to delete, just hit Return at the prompt that asks for the insert string. This macro can be easily modified to run on an entire document—just have it move down one cell and loop.

Kurt Kunz
Bismarck, North Dakota

This is a sophisticated macro that deserves some detailed analysis over and above a simple description of its operation. Its real brains are in the formula in cell D13, which is displayed at the bottom of the figure. It uses the @replace function, whose general format is

@replace(original string,start number,number of characters to delete,new string)

In this case, the original string is @a(CELLPOS), which is the contents of the cell whose address is in the range CELLPOS. That cell, D8, returns the address of the cell you put the cursor on, thanks to a formula that uses the @cellpointer function.

The start number, i.e., the point at which deletion begins, is returned by

#FIND(\$DELETE,@a(CELLPOS),#)

This function, in turn, has a general format of

@find(string we are looking for,original string,start number)

Its job is to find the place in the original string where the string we are looking for begins. In this case, of course, what we are looking for is the string that we wish to delete—\$DELETE—and the original string is once again the contents of the cell with the cursor—@a(CELLPOS). The last argument, the 0, indicates that we want to start searching the original string from its beginning. All together, the @find formula gives us the point in the text where the @replace function starts deleting characters.

The number of characters to delete, @length(\$DELETE), is simply the length of the string you have told the macro to put

	C	D	E
3	\a	{GETLABEL ENTER STRING TO DELETE,DELETE}	
4		{GETLABEL ENTER STRING TO INSERT,INSERT}	
5	loop	{calc}	
6		{IF @iserr(find)}{QUIT}	
7		/cvfnd	
8	CELLPOS	\$D616	
9			
10		{BRANCH loop}	
11	DELETE	road	
12	INSERT	path	
13	FIND	ERR	
14			
15			
16			The path of excess leads to the palace of wisdom.

These cells contain the following formulas:
 D6: #CELLPOINTER("ADDRESS")
 D13: @REPLACE(@a(CELLPOS),#FIND(\$DELETE,@a(CELLPOS),#),@length(\$DELETE),\$INSERT)

Figure 3: A 1-2-3 macro that does a search and replace.

■ I try to stay away from giant, hard-to-understand formulas. However, if you really want to cram as much as possible into one cell, I know a way to break the 240-character limit.

into the range DELETE in response to the prompt. The new string, which is to be inserted, is what went into the range INSERT.

The reason for the IF test in cell D6 is to see whether there actually are any occurrences of the string you want to delete. It looks for ERR in cell D13, which is what will be there if the @vfind function fails to find whatever it was looking for. The IF test, along with the {BRANCH loop} in cell D10, lets you delete repeated occurrences of the same delete string within the same cell.

Finally, the routine in cells C7 through C9 takes the value of C13 and copies it to the cell containing the cursor. In this example, the word "road" was deleted from the sentence and "path" was put in its place.

WIDTH PROBLEMS

Occasionally I run into a problem with 1-2-3 because I have written a formula containing more than 240 characters and it won't fit into a cell. One solution is to give up absolute cell references, because that saves 1 character for each \$ you remove. That can be risky, though, if you forget and copy the formula later.

Another trick you can sometimes use is to make sure that as many as possible of the cells you reference in a formula are between columns A and Z. The address Z6 takes up fewer characters than AA6.

I run into width problems in printing as well. I have found, though, that the NEC 8800 Spinwriter, with a 10-pitch daisy wheel, can be made to "compress" print by reducing the space between characters. With the setup string \027093\072 the characters will be so close they are actually touching, but they will still be legible. With this string you can get 49 percent more characters on a line.

Jeff Grant
Lanham, Maryland

I try to stay away from giant formulas because they're often hard to understand. However, if you really want to cram as much as possible into one cell, I know a way to break the 240-character limit.

Just for fun, do a Data Fill, starting in cell A1, and use End-Right Arrow to make the whole row the data fill range. You can use anything for a start number, but zero is easiest. Now comes the work. In cell A2, start adding up the values in the row above

■ SPREADSHEET CLINIC

until you reach the 240-character limit. $+a1+b1+c1+d1+e1+f1$, etc., should get you to about $+b1$ before 1-2-3 starts beeping. Cell A2 now contains a very long formula and displays a total.

Next, do a move operation, and put everything in rows 1 and 2 into rows 10 and 11. None of the numbers will change, but if you edit the formula cell, which is now in A11, you will see that all the 1s in the original formula have changed to 10s. If you hit End to get to the last part of the formula in cell A11, you won't find $+B10$, but something like $+BA10$. That's because 1-2-3 can't display more than 240 characters in a formula.

However, the rest of those addresses are still part of the calculation, as you'll find if you go out cell BF10, for example, which is beyond the end of the displayed formula, and put a new number in it. The total in A11 will change to reflect the new value—just what you'd expect.

You can stuff even more characters into the cell by copying A11 out to AA11. That cell will still faithfully reflect the values it references, even though you can't see all the addresses in edit mode.

You can't, however, actually edit one of these overstuffed formulas. As soon as you do that, it will truncate the part that it can't display, and you'll be stuck with results that reflect the same old 240-character limit.

This is more of a parlor trick than a solution, but it might come in handy once every 5 years.

QUICK UNHIDE

In Release 2.0 of 1-2-3 you can hide columns. The data doesn't go away; you just can't see it. When you need to look at hidden data, don't bother with using /Worksheet Column Display to unhide columns. All you need to do is go into point mode by hitting the Plus key and moving the cursor.

All hidden columns and their contents will be temporarily revealed. This affects the entire worksheet, so whichever screenful you view will show hidden data.

After you've seen what you're interested in, hit Esc. This will take you out of point mode, rehide the columns, and take you back where you began. Another Esc will erase the plus sign in the cell and take you back to ready mode.

Jim Pottkotter
Memphis, Tennessee

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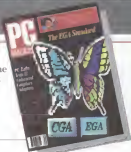
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■ EDITED BY CRAIG L. STARK

POWER USER



Give yourself extra lines in MS Windows screens, fix error-handling bugs in C and MASM, and add directory-switching for WordPerfect data files.

CD FOR WP

WordPerfect's setup menus make no provision for designating a default subdirectory for storing data files—as do programs such as 1-2-3. Here's a solution to the problem.

First create a macro that automatically changes the default directory to the one that contains your files. Type

```
Ctrl-F10 CHDIR <CR>
F5 = d:\pathname <CR>
<CR>
Ctrl-F10
```

The first line begins defining the macro CHDIR. The second line changes the default directory to d:\pathname (the drive and full path for the directory). The third line gives the command to list the files, so you see your data files when you start the program. The last line ends the macro definition.

The next step is to use WordPerfect's /M option, which automatically invokes a macro when you start the program. The format for this option is WP/M-{macro-name}. You can then use WordPerfect itself to create WDP.BAT, a batch file with just one line in it:

```
WP/M CHDIR
```

Make sure to save this with the Text Out command (Ctrl-F5).

Now you can start WordPerfect with the command WDP, and it will automatically change the default directory to one that contains your WordPerfect data files. Alternatively, you can omit the WDP.BAT file and use the DOS SET

command to load this program parameter into your PC's environment. Simply put the line

```
SET WP=/M CHDIR
```

in your AUTOEXEC.BAT file. Then you can start WordPerfect by typing WP at the DOS prompt, and you will get the same results as above.

Steve Gehlen
Stayton, Oregon

As Mr. Gehlen notes, this is only one solution to the problem. There are others that may be better. This approach assumes that you have only one data directory. While this may be appropriate for a floppy disk system, there are limits to how many files you will want to keep in a single directory on a hard disk. As the number of files grows, you'll need to group them in some way—probably by client or by type of document. Each group of files goes into its

own directory, and you'll want some easy way to load WordPerfect and not be taken to the wrong directory.

You could create a macro for each data directory on your disk, and a batch file to go with it. CORR.BAT could run a macro to take you to your correspondence directory. RPT.BAT could run a macro to take you to your business reports, and so forth. However, there's an easier way. You can load WordPerfect from any disk and directory simply by using the command

```
d: /pathname/wp
```

where d:\pathname designates the correct disk and directory for finding WP.EXE. When you load the program in this way, your currently logged disk and directory will automatically become the default data directory.

Even better, you can use the PATH command so that DOS will always look to the WordPerfect directory no matter where you are on the disk. If you keep the WordPerfect program in the directory C:\WDP, just add the following line to your AUTOEXEC.BAT file:

```
PATH=C:\WDP
```

Now you can type WP and load WordPerfect from anywhere on your system. Once again, WordPerfect will accept the currently logged drive and directory as the default data directory.

This second approach lets you go to the desired directory first, and then load WordPerfect. You can do this either manually or with a series of .BAT files of the form:

■ One nice touch in Mr. Gehlen's CHDIR macro is that the program automatically shows you a list of available files when it starts up.

■ POWER USER

```
d:
cd \pathname
wp
```

The first line logs you on to the proper disk, the second takes you to the proper directory, and the third loads WordPerfect.

If you're already working in WordPerfect and want to change to another directory, you can use a series of macro files similar to CHDIR, each of which takes you to an appropriate directory. Make sure that all the MAC files are in the WordPerfect program directory so that the program can find them when it needs them.

Incidentally, one nice touch in Mr. Gellien's CHDIR macro is that the program automatically shows you a list of available files when it starts up. This is worth keeping—and not just when changing directories from within the program. If you use .BAT files to load the program, as I've just suggested, change the third line to

```
wp/m start
```

And create the macro START.MAC to read

```
F5 <CR>
```

This will automatically show you the directory file listing when you start WordPerfect, and in addition to letting you choose a file to work with, it will confirm that you're in the right directory.

—M. David Stone

HANDLING ERROR MESSAGES IN C

One thing I soon noticed when I started using the Microsoft C Compiler, Version 3.0, is that there seemed to be no way to produce a source listing with merged error messages. Such a merged file would be useful when you go back into your source code to fix the errors.

Since the error messages are written to the standard output stream, they can be redirected to a file. In fact, you could even append these messages to the C source code. But I wanted something that would pair each message to the source code line.

The program LISTING.C, shown in Figure 1, does this. It assumes that an error listing is available from standard input and merges these messages in with the source code. You can then go through your source code and zap the error messages out at the

```
#include <stdio.h>
#include <io.h>
#include <string.h>

main (argc,argv)
unsigned argc;
char *argv[];
{
    char
    errmsg[135], srcline[135];
    static char
    *tempfile = "XXXXXX";
    static char
    *format = "/**** %s ****\n";
    int
    linenum = 1, errline, namelen;
    FILE
    *infile, *outfile;

    if (argc > 1 && (infile = fopen (argv[1], "r")) &&
        (outfile = fopen (mktemp (tempfile), "w")))
    {
        namelen = strlen (strupr (argv[1]));
        while (gets(errmsg))
        {
            if (strcmp (strupr (errmsg), argv[1], namelen))
                fprintf (outfile, format, errmsg); /* include files */
            else
            {
                errline = atoi(1 + strchr (errmsg, '('));
                while ((linenum < errline) && fgets (srcline, 135, infile))
                {
                    fputs (srcline, outfile);
                    linenum++;
                }
                fprintf (outfile, format, 3 + strchr (errmsg, '('));
            }
            while (fgets (srcline, 135, infile)) fputs (srcline, outfile);
            fclose (infile);
            fclose (outfile);
            unlink (argv[1]);
            rename (argv[1], tempfile);
        }
    }
}
```

Figure 1: A C program that pairs compiler error messages to the appropriate source code lines.

same time you correct the errors. (Since the errors are included as comments, nothing bad will happen even if you forget to remove some of them.) The only real problem is that the program is not sophisticated enough to follow "include" files or to deal with error messages longer than one line.

You can compile LISTING with the Microsoft C Compiler 3.0 using the following commands:

```
MSC LISTING;
LINK LISTING;
```

The syntax to use the program is

```
MSC progname; | LISTING progname.c
```

Al Sato
College Station, Texas

This works very well. The use of C to pro-

gram your own tools to make it easier to program in C is a tradition as old as the language itself.

There are a couple of things to watch out for when using LISTING, however. For one thing, if you don't include the semicolon after the MSC command line, the prompts (for OBJ and LIB names) go to standard output and hence to the redirected file. (This is a mistake in the compiler, I believe.) Also, if you have batch files that run MSC and use the return code for branching logic, note that the return code will be the one from LISTING rather than the one from MSC.

LISTING shows some good uses of the string library that is included with the Microsoft C Compiler 3.0. It is quite extensive and lends itself well to compact programming. For example, I recently had to clean up some files that had a bunch of

```
main ()
{
    char
    line [1000];
    while (gets (line))
        puts (strrev (line + strlen (strrev (line), " \t*"));
}
```

Figure 2: A C application for stripping excess blanks from line ends.

■ POWER USER

trailing blanks and tabs at the end of each line. The program I wrote to do it is shown in Figure 2. It uses redirected input as output, as follows:

```
STRIPEND <infile >outfile
```

where infile and outfile are different filenames.

Since the format of the error message listing of the Microsoft Macro Assembler 4.0 is similar to the one from the C Compiler, you may want to use Mr. Sato's LISTING program in conjunction with MASM also. There's just one little problem, however, as from the letter following.

—Charles Petzold

A LITTLE "FLAW" IN MASM

I have found a flaw in Microsoft's Macro Assembler 4.0. I say "flaw" instead of "bug" because it seems to be intentional. The assembler sends errors to standard error output (always the screen) instead of standard output. This is not a problem unless you like to redirect your errors to a file so that you can look at them while you fix the source. To send the errors to standard output, you can patch MASM and create a fixed-up version called MASMSO.EXE using the following commands:

```
COPY MASM.EXE MASMSO
SYMBE MASMSO
E (CS+1000):4C11 1
W
Q
RENAME MASMSO MASMSO.EXE
```

MASMSO.EXE will now send errors to standard output.

Bruce Labes
Wichita, Kansas

Calling this problem with MASM a flaw is too kind. It looks to me like a downright mistake. Standard error output is supposed to be used for messages that indicate an error in the functioning of the program or for messages that must appear on the screen to alert the user to something. For instance, if you execute

```
DIR >SOMEFILE
```

on a full disk, you'll get the message

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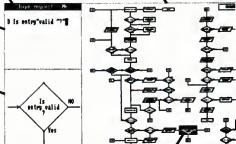
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not to send this message to standard output because it would then wind up in the file that it can't write to in the first place.

For the macro assembler to use standard error output for a normal error listing makes no sense at all. Moreover, if you do redirect MASM output to a file, the file will contain the copyright notice and the error summary listing. It seems to be that this information more properly should be sent to standard error output and always end up on the screen. To fix that problem as well, add this line to Bruce Labes's patch right after the first E statement:

```
E (CS+1000):C0B9 2
```

With this patch added to Mr. Labes's you can then use the patched MASMSO with Al Sato's LISTING program, thus:

```
MASMSO progname | LISTING progname.ASM
```

Incidentally, I'd normally show how to make these patches by using DEBUG, and

■ **Microsoft's Macro Assembler 4.0 sends errors to standard error output (always the screen). Calling this a flaw is too kind.**

that's the way Mr. Labes submitted his. He indicated you should do an R (Register) command and add 1000h to the value of CS before doing the Enter command. But since owners of MASM have the benefit of a much more powerful SYMDEB at their disposal, I changed the patch to let SYM-

DEB do the addition for you.
—Charles Petzold

LESS IS MORE

The 43-line mode of the Enhanced Graphics Adapter (EGA) is one of the best features of the adapter and gives us a little taste of what big-screen workstations are like. One program that adapts very nicely to this mode is Microsoft Windows. You can install Windows to use a smaller font and display more lines per screen very easily without patching any of the Windows files. The result is actually more like a 38- or 39-line display, but the difference is dramatic. This technique will work with an EGA or Hercules Graphics Card attached to a monochrome display or with an EGA (128K or 256K of on-board memory required) attached to an Enhanced Color Display.

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preferably, a copy of it), execute the following two commands:

```
RENAME HIFONTS.FON HIFONTS.OLD
RENAME LOFONTS.FON HIFONTS.FON
```

Now reinstall Windows. You'll notice the change immediately when you bring up the program and the MS-DOS Executive lists 30 files per column instead of 18. This change also lets you see 17 (rather than 7) cards on a screen with CARDFILE, adds 11 more lines in NOTEPAD, and makes the CALENDAR and CALCULATOR smaller and more manageable on a crowded screen.

To reinstall a normal version of Windows, just rename the files back as they originally were:

```
RENAME HIFONTS.FON LOFONTS.FON
RENAME HIFONTS.OLD HIFONTS.FON
```

The theory behind this is simple: LOFONTS.FON and HIFONTS.FON both contain "System" and "Terminal" fonts. These are plain-vanilla fonts used by pro-

■ You can install Windows to use a smaller font and display more lines per screen without patching Windows' files.

grams that need to display only unadorned text. The System font contains the ANSI character set and is used by MS-DOS Executive, NOTEPAD, and some other Windows applications. The Terminal font is an "OEM Font" (i.e., it's the IBM character set) and is used when you run old applications in a window. LOFONTS contains 8 by 8 versions of these fonts for a 200-scan-

line display, and HIFONTS contains 8 by 12 versions for a 350-scan-line display, but the characters are normally displayed with 1 or 2 leading blank scan lines.

The Windows SETUP program links the appropriate font file into Windows during installation. All we're doing is tricking the SETUP program into linking in a different file that gives us a smaller character size on the screen.

—Charles Petzold

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■ PAUL SOMERSON



USER-TO-USER

Two approaches to automatic command entry, a solution to a new DOS bug, an updated CLS patch, and some powerful BASIC utilities.

FORCED ENTRY

While the battery-powered clock that sets the time and date on my system saves me from having to do so manually, it unfortunately forces me to hit the Enter key twice to do so.

To get around this, I wrote a 32-byte assembly language program called ENTER.COM that places the scan code for the Enter key into the first two memory locations of the keyboard buffer. Create ENTER.COM by typing in the ENTER.SCR file in Figure 1 with a pure-ASCII word processor, then redirect this script file into any version of DEBUG.COM 2.0 or later with

DEBUG < ENTER.SCR.

Then just precede the DATE and TIME commands in your AUTOEXEC.BAT batch file with the command ENTER.

Frank Tracy
Oxnard, California

It's crazy for a board manufacturer to insist that users hit the Enter key manually to read the time and date from a clock into DOS. Preceding TIME and DATE with ENTER will save the manual key taps, but it's just as easy to create a small file called CR that contains nothing but a carriage return and then redirect it into DOS:

```
TIME < CR
DATE < CR
```

3.2 SPEED BUG

IBM PC-DOS, Version 3.2, boasts an insidious (but easily correctable) bug—Internal Stack Error. Simply hitting the Pause key on the new IBM keyboard rapidly 10 times will produce this error message and lock your system, forcing a power-down restart.

The DOS manual states that this error is caused by a "rapid succession of recursive hardware interrupts" and suggests adding the command STACKS=N,S to your CONFIG.SYS file. N represents the number of stack frames, where the default is 9 and the range is 8 to 64. S is the size in bytes of each frame, where the default size of each stack frame is 128 bytes and the range is 32 to 512. Using this STACKS statement reduces available memory.

While most users don't pound the Pause

key, a fast typist inputting data into a 1-2-3 spreadsheet can easily trigger the error. I've seen such an input bug halt systems more than once, resulting in lost data, time, and effort.

We've pretty much eliminated the problem by adding

STACKS=32,256

to our CONFIG.SYS file, which lets us pound on the Pause key about 25 times before causing an error.

Antonio D. Wilkinson
Dallas, Texas

A nasty bug, and a handy fix. Still, this is yet another reason to save your work to disk often.

BASIC FILE MAGIC

Many of the programs published in PC Magazine deal with files, directories, and file attributes. Programs like WHERE are

■ It's crazy for a board manufacturer to insist that users hit the Enter key manually to read the time and date from a clock into DOS.

```

N ENTER.COM
A
PUSH AX
PUSH DS
MOV AX,0040
MOV DS,AX
MOV AX,1C0D
MOV [001E],AX
MOV [0020],AX
MOV AX,001E
MOV [001A],AX
MOV AX,0022
MOV [001C],AX
POP AX
POP DS
INT 20

RCX
20
W
Q

```

Figure 1: ENTER.SCR script to create ENTER.COM. Type this in using a pure-ASCII word processor or the DOS COPY CON command. Be sure to hit the Enter key after each line, especially the last one, and leave a blank line above RCX. Then put DEBUG.COM (Version 2.0 or later) on your disk and type DEBUG < ENTER.SCR.

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■ USER-TO-USER

```
100 ' UTILITY.BAS -- by Bill Dehl -- File locating and free space utilities
110 GOTO 130
120 PRINT:PRINT "Hit any key to continue":WHILE INKEY$=""WEND
130 CLS:CLS
140 PRINT "Select Dns: 1--Show available disk space"
150 PRINT "2--Show space taken up by subdirectory"
160 PRINT "3--Show location of any files"
170 PRINT "4--Quit"
180 IS=INKEY$:IF IS="" OR INSTR("1234",IS)=0 THEN 100 ELSE PRINT
190 ON VAL(IS) GOTO 240,350,430,280
200 END
210 '
220 ' *** Calculate Available Disk Space ***
230 '
240 IS=0:SECTORS=0:AVAILCLS=0:BYTES=0:TOTCLS=0:AV=0:TOT=0:GOSUB 600
250 PRINT "Enter Drive (A-E): ";
260 IS=INKEY$:IF IS="" THEN 240 ELSE IDIR=INSTR("ABCDEF",IS)/2
270 IF IDIR=5 OR IDIR=6 THEN 260 ELSE PRINT "
280 IS=VARPTR(INT4$(1)):CALL IS(DIR,SECTORS,AVAILCLS,BYTES,TOTCLS)
290 AV=AVAILCLS*SECTORS*BYTES:TOT=TOTCLS*SECTORS*BYTES
300 PRINT USING "00,000,000  BYTES OF 00,000,000  AVAILABLE":AV:TOT
310 GOTO 120
320 '
330 ' *** Calculate space used by subdirectory ***
340 '
350 GOSUB 600:SUBDIR=0:FILENAME$=""::ATTRIB=16:INPUT "DIRECTORY: ",DIR$(1)
360 DATTY=0
370 GOSUB 490
380 IF IERR<0 THEN TOTBYTES=TOTBYTES+FNBS$(FILENAME$):GOTO 370
390 PRINT USING "00,000,000  BYTES OF 00,000,000  AVAILABLE":TOT
400 '
410 ' *** Locate file on disk ***
420 '
430 GOSUB 600:SUBDIR=1:DIR$(1)=""::ID=1:INPUT "FILE NAME: ",FILENAME$
440 IF FILENAME$="" THEN FILENAME$="."
450 GOSUB 490
460 IF IERR<0 THEN PRINT DIR$(ID)+"*FNUL$(31,FILENAME$):GOTO 450
470 GOTO 120
480 '
490 ' *** Get Next Filename ***
500 '
510 IF INKEY$ THEN ISUB=VARPTR(INT4$(1)):CALL ISUB(FILEINFO$,IERR):GOTO 540
520 INKEY$=1:FILEINFO$=FNBS$(DIR$(ID)+"*"+FILENAME$+NULL$(10))
530 ISUB=VARPTR(INT4$(1)):CALL ISUB(FILEINFO$,ATTRIB,IERR)
540 IF IERR=0 THEN RETURN
550 IF SUBDIR THEN GOSUB 500 ELSE IERR=1:INKEY$=0:RETURN
560 IF IERR=1 THEN INKEY$=0:RETURN ELSE 520
570 '
580 ' *** Get Next Directory ***
590 '
600 ID=ID+1:DIR$(ID)=FNBS$(DIR$(ID-1)+"*"+NULL$(10))
610 DATTY=0:ISUB=VARPTR(INT4$(1)):CALL ISUB(DIR$(ID),DATTY,IERR)
620 IF IERR=0 THEN 650
630 IF FNAT$(DIR$(ID)) AND 16 < 16 THEN 660 ELSE DIR$(ID)=FNUL$(31,DIR$(ID))
640 IF ASC(DIR$(ID))=66 THEN 660 ELSE DIR$(ID)=DIR$(ID-1)+"*"+DIR$(ID):RETURN
650 ID=ID+1:IF ID=1 THEN IERR=1:RETURN
660 ISUB=VARPTR(INT4$(1)):CALL ISUB(DIR$(ID),IERR)
670 IF IERR=0 THEN 630 ELSE 650
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*My department
took all the blame*

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■ USER-TO-USER

```

DB      *INT404*
NOP
PUSH   BP
MOV     BP,SP
MOV     SI,[BP+0A]
MOV     DI,[SI+1]
MOV     AX,IA
INT     21
MOV     SI,[BP+0B]
MOV     CX,[SI]
MOV     AX,4E
CLC
INT     21
JC      $122
XOR     AX,AX
MOV     BP,[BP+0E]
MOV     DI,[SI+1]
MOV     AX,IA
INT     21
CLC

; FIRST FILE CALL (NAMES,ATTRIBUTES,ERRORS)
; ADDRESS OF NAMES PACKET
; ADDRESS OF NAMES INTO DB
; CHANGE DTA ADDRESS
; ADDRESS OF ATTRIBUTES
; VALUE OF ATTRIBUTES INTO CX
; FIND THE FIRST FILE
; MAKE CERTAIN CARRY FLAG IS CLEAR

; MAKE CERTAIN AX IS ZERO - NO ERROR
; ADDRESS OF ERRORS
; PUT ERROR NUMBER INTO ERRORS
; RETURN TO BASIC

*INT4F4*
; NEXT FILE CALL (NAMES,ERRORS)
; ADDRESS OF NAMES PACKET
; ADDRESS OF NAMES INTO DB
; CHANGE DTA ADDRESS
; MAKE CERTAIN CARRY FLAG IS CLEAR
  
```

(continues)

Figure 3: Assembly language code for subroutines in *UTILITY.BAS* that show available disk space, subdirectory space, and file locations.

very useful and could be even more useful with "just one small change."

However, since I am not comfortable with assembly language (in which many of the programs are written), I created the short BASIC routines in Figure 2 to make such chores easier for me. The subroutines (see Figure 3 for the actual assembly language code) move through directories and return file information. BASIC handles the arithmetic, print formatting, and program logic. Using BASIC like this makes everything far easier to write and modify.

Bill Dahl
Adelphi, Maryland

Readers have been hounding us for subroutines like these to spruce up their BASIC programs. While these aren't perfect and while you can accomplish similar DOS tasks by using the BASIC SHELL command, they do add real power to conventional BASIC.

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■ USER-TO-USER

```

MOV     AX,4F          ; FIND THE NEXT FILE
INT     21
JC      $14A           ; SOME KIND OF ERROR RETURN
XOR     AX,AX          ; MAKE CERTAIN AX IS ZERO
MOV     BP,[BP+86]      ; ADDRESS OF ERROR
MOV     [BP+88],AX      ; PUT ERROR NUMBER INTO ERROR
POP     BP              ; RETURN TO BASIC
RETF    8684
NOP
DB      "INT26$"
NOP

(DIRNUM%,SECTORS%,AVAILABLE_CLUSTERS%,BYTES_PER_SECTOR%,TOTAL_CLUSTERS%)
PUSH    BP
MOV     BP,SP
MOV     SI,[BP+8B]      ; ADDRESS OF DISK NUMBER
MOV     DX,[SI]         ; DISK NUMBER INTO DX
MOV     AX,36          ; FREE DISK CALL
INT     21
MOV     SI,[BP+8C]      ; ADDRESS OF NUMBER OF SECTORS PER CLUSTER
MOV     [SI],AX
MOV     SI,[BP+8A]      ; ADDRESS OF AVAILABLE CLUSTERS
MOV     [SI],BX
MOV     SI,[BP+8E]      ; ADDRESS OF BYTES PER SECTOR
MOV     [SI],CX
MOV     SI,[BP+86]      ; ADDRESS OF TOTAL NUMBER OF CLUSTERS
MOV     [SI],DX
POP     BP
RETF    868A           ; RETURN TO BASIC - 5 ARGUMENTS
NOP
NOP

```

(Figure 3 ends)

3.2 COMMAND.COM PATCH

PC Magazine (User-to-User, Volume 4 Number 25) published a list of COMMAND.COM patches to set the CLS colors in DOS Versions 2.0 through 3.1. Since then IBM has released DOS Version 3.2. The instructions for customizing this new version so that CLS produces bright yellow text with a blue background and border follow. Create a file called CLSPATCH containing these instruc-

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■ USER-TO-USER

■ It's really a shame that IBM and Microsoft don't admit that mono is dead. DOS patches shouldn't be necessary.

ions, put CLSPATCH, DEBUG.COM, and COMMAND.COM on your disk, then type

DEBUG < CLSPATCH

Be sure to leave the blank line before the W, and hit the Enter key after each line, especially the last one. Remember also that this is for Version 3.2 only.

N COMMAND.COM

L

E 282E 1E

M CS:281E 283A CS:2818

A 2835

MOV BL, 01

MOV AH, 0B

W

Q

Randall Knox
Culver City, California

If you customize COMMAND.COM this way, don't mix patched and unpatched versions on your disks, or you'll befuddle DOS. It's really a shame that IBM and Microsoft still don't admit that mono is dead; DOS still thinks users want to work in gray-on-black. Patches like the one above—and color-setting programs like the ones frequently published in this column—shouldn't be necessary.

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PC TUTOR

Getting a handle on DOS files and finding the best ways to compensate for a collection of DOS quirks including a bug in early versions of TREE.

DOS QUIRKS

I've encountered several quirks—some downright bugs—in the MS-DOS that came with my Panasonic Sr. Partner. I'd appreciate your views on them and solutions to the problems:

(1) For the command

```
COPY FILE1 FILE2
```

if FILE2 already exists but FILE1 is much larger than available disk space, DOS aborts the COPY with an "Insufficient disk space" message but also deletes FILE2. It's like a "Shoot first, ask questions later" approach.

(2) The command

```
DEL *ABC.EXE
```

deletes all .EXE files! What I really want to do is delete all .EXE files with names ending with ABC. Wouldn't "Invalid parameter" be a better message?

(3) The batch file statement

```
REM Now returning to the A> prompt
```

doesn't display anything after the > and creates a file called PROMPT.

When I wrote to Microsoft about these (and other) problems, it responded by saying, "BASICA and MS-DOS were written under contract for Matsushita. Under our licensing agreement, they both market and support the product. We are prohibited from releasing information about the product. Therefore, please contact Matsushita for answers to your questions." Nice support.

W. Lawrence Hill
Falls Church, Virginia

These three commands all work as you've described in PC-DOS, Versions 2.0 through 3.2, so at least PC-DOS and MS-DOS are consistent here. They're good examples of commands that ask COMMAND.COM to be more intelligent than an 18K to 24K file has any right to be.

(1) To determine whether enough disk space exists to copy FILE1 to FILE2, COMMAND.COM would have to check to see if the space available on the disk plus the size of FILE1 is less than or equal to the size of FILE2. Instead, the COPY command creates the destination file FILE2 (erasing the old one in the process) and then tries to copy the contents of FILE1 to it. If this fails, FILE2 is gone. I really don't see the damage though, since you were intending to nuke the existing FILE2 anyway.

But here's one I've been burned on

```
COPY A:*.COM SUBDIR
```

```
DEL A:*.COM
```

where SUBDIR is a subdirectory into which I want to copy all the .COM files. If I make a mistake and type something like SUBDIT, which is not an existing directory name, COPY will create a file called SUBDIT and copy all the .COM files into it. Since this is an ASCII copy (because the syntax implies I'm concatenating the files), it stops copying after the first ASCII end-of-file marker in each of the .COM files. Result: garbage.

(2) I've seen this one before. I did something similar once and wiped out a bunch of files. An "Invalid parameter" message would be preferable because the construction is ambiguous. At some point in COMMAND.COM or DOS, an asterisk in a global file specification is expanded into question marks. This allows DOS to search through the disk directory for matches.

An asterisk followed by letters looks OK, but what does it really mean? Are you telling COMMAND.COM to do this:

```
DEL ?ABC.EXE
```

or this:

```
DEL ??????ABC.EXE
```

Or do you want something in between, or all the possible variations?

*The PC-DOS 3.2 manual says this: "An * in a filename or in a filename extension indicates that any character can occupy that position and all the remaining positions in the filename or extension." It's documented exactly the way it works.*

(3) This is kind of annoying, because it prohibits you from displaying any of the



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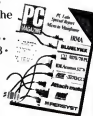
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DOS redirection symbols (<, >, and \) from a REM or ECHO statement. The parsing of command lines (such as those in a batch file) goes through several different stages in COMMAND.COM.

COMMAND.COM has to search the command line for redirection symbols early in the process. If it finds any, it has to open or create the appropriate files—in this case the file PROMPT. Then it executes the actual command.

COMMAND.COM doesn't know that REM is a do-nothing instruction when it's setting up the redirection files.

Although it doesn't make any sense for a REM statement, I've used redirection in ECHO. For instance, this is an easy way to send a form-feed out to a printer from a batch file:

```
ECHO ^L >PRN
```

(where ^L is created by typing Ctrl-L).

I agree that the licensing arrangements between Microsoft and its OEM (Original Equipment Manufacturer) customers regarding MS-DOS support do not benefit the consumer. Microsoft obviously knows more than anybody else about MS-DOS and should be the one supporting it for those of us who are using it.

A TREE WITH BROKEN BRANCHES

I recently put one of those hard-disks-on-a-card in my IBM PC and started to set up a lot of subdirectories.

However, the PC-DOS 2.1 TREE command doesn't list them all. I know they are there because they are listed by DIR, I can get into them, and they are displayed by the VTREE program. ("A Sight Better than TREE," Programming/Utilities, Volume 4 Number 22, also available from the PC Magazine Interactive Reader Service.)

How can this be? Is there a bug in the TREE command that I haven't heard about? Or is there something wrong with my hard disk?

Steven Delibert
New York, New York

It's a bug in TREE. The example you sent with your letter had a subdirectory name with an extension (specifically, ONE-WRITE.PLS). When the TREE command in PC-DOS 2.0, 2.1, and 3.0 encounters

something like this, it stops processing after it has finished with child directories of the extended directory. This bug is fixed in the TREE command included with PC-DOS 3.1 and 3.2.

The earlier TREE versions also do not list files in the root directory when you include the /F parameter. The upgraded TREE in DOS Versions 3.1 and 3.2 fixes this problem also.

Unfortunately, IBM has no upgrade policy for PC-DOS, even to correct obvious bugs.

I recall reading about somebody's finding the following message in some other IBM program: "If IBM had wanted you to use subdirectory names with extensions, they would have shown you some examples in the manual." Not quite, guys. If IBM (or Microsoft) did not want us to use subdirectory names with extensions, they would have prohibited them. Subdirectory names with extensions are not prohibited under DOS, so I doubt you'll find many other problems that fall out of the tree like TREE does.

HANDLES AND DEVICES

This question seems of more theoretical than practical interest and has to do with the way DOS handles redirection of standard output. It seems somewhat inconsistent to me.

I can display an ASCII file to the screen with

```
COPY filename CON
```

because the output device CON is the display. This command does basically the same thing as

```
TYPE filename
```

Likewise, I can copy a file to the printer with

```
COPY filename PRN
```

The file goes to the printer, and the message about one file being copied appears on the screen. Using redirection of standard output, I can also copy a file to the printer with the command

```
TYPE filename >PRN
```

Based on this, I would think that the command

```
COPY filename CON >PRN
```

■ PC TUTOR

would copy the file to the printer, because the COPY command is copying it to the screen and the screen is redirected to the printer. But it doesn't. Instead, it just copies the file to the screen and sends the "file(s) copied" message on the printer.

This doesn't make much sense to me. Is it a bug in DOS?

James R. Dowland
Little Rock, Arkansas

While the results look a little peculiar, DOS is actually working consistently. To

■ Beginning with Version 2.0, DOS adopted a "handle" approach to working with files and devices.

understand why, we have to make a distinction between devices (CON and PRN) and the handles that programs use to refer to these files and devices.

Beginning with Version 2.0, DOS adopted a "handle" approach to working with files and devices. When a program such as COMMAND.COM opens a file or device for the COPY or TYPE commands, it tells DOS the filename and DOS returns a "handle"—which is simply a number—that refers to the file.

DOS maintains two tables that correlate the handles with the files or devices to which they refer. The first table is located in the program's Program Segment Prefix starting at offset 18h. The number at address (18h + Handle) refers to a second internal DOS table that contains the file or device name and other information that DOS needs to read from or write to the file.

The restriction of 20 file handles per program derives from the length of this table in the Program Segment Prefix. The maximum number of open files that DOS can maintain depends upon the space allocated for the internal DOS tables and is governed by the FILES statement in a CONFIG.SYS file.

When a program begins execution, five file handles are already defined. Normal-

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ly, handle 1 (which is defined as standard output) is mapped to the output device CON, which is the display.

TYPE reads the file and writes it with Function Call 40h using a handle of 1, so

output normally goes to the CON device. However, when you redirect standard output to PRN, using the command

TYPE filename >PRN

COMMAND.COM opens the PRN device to get a handle for it, and then uses the **FORCUP** Function Call (40h) to make handle 1 refer to the PRN device. So, TYPE is still writing the file using handle 1, but the handle refers to a device other than CON.

When you specify CON or PRN as the destination in a COPY command, COMMAND.COM opens that device through DOS, gets back a handle for it (which will not be one of the predefined handles), and uses that handle for writing the file.

Thus, the two commands

COPY filename PRN

and

TYPE filename >PRN

are not really the same. In the first case,

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■ **COMMAND.COM** tells DOS the filename and DOS returns a "handle" that refers to the file.

COPY uses a handle that refers to the device PRN. In the second case, TYPE uses handle 1, but this handle has been redirected to the device PRN.

So, when COMMAND.COM executes the command

COPY filename CON >PRN

it first redirects handle 1 to the PRN device. But then COPY opens the device called CON for the destination and DOS returns a new handle that refers to this device. The file appears on the screen because the COPY command is writing it using this new handle. It then writes the "file(s) copied" message to standard output (the handle 1), but this message goes out to the printer because the handle has been redirected.

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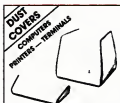
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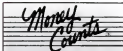
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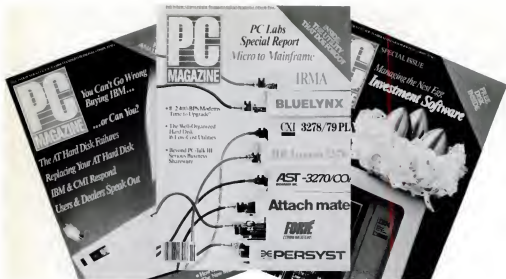
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COMING UP

SPECIAL BLOCKBUSTER ISSUE: PRINTERS Of the 287 or so printers that have been put to the test in PC Magazine Labs over the past 3 years, most are still available, making the printer market one of the most crowded there is. In our next issue, 15 extremely energetic reviewers take on 97 of the newest printers we could find.

There are quite a few new developments in printers to watch out for in this third annual "look-no-further buyer's guide to printers." Nineteen eighty-six has been the year of the Ricoh laser printer engine. Will it unseat Canon, the traditional engine leader? And what about color printers? They're standard equipment in many business settings, but is red really red, and how blue are the blues?

Laser printers are more plentiful and cheaper this year. Many experts agree that these top-of-the-line machines will soon proliferate on a huge scale, especially if the long-predicted boom in desktop publishing takes off. Decide for yourself if now is the time to consider the near-typeset quality they can offer.

And you'll notice that the front panels of many machines are more helpful than ever, with some sporting LED and LCD indicators. Find out which printers allow you pushbuttons on the outside and which ask you to flip up the cover and set DIP switches inside.

Our comprehensive roundup is divided into dot matrix, daisy wheel, and laser categories so that you can easily find and study the type of printers that interests you the most.

And get ready for another edition of PC Magazine's famous features tables. They will organize all the details into one easy-to-read, informative display and make the facts readily accessible.

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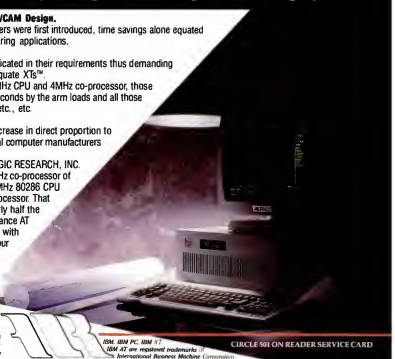
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Introducing the 10/6 MHz Multitech 900

Innovation without compromise



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The Multitech 900 operates at 6 or 10 megahertz. With this speed advantage switching from 6 to 10 megahertz cuts processing time almost in half — you spend less time waiting for the information you need to analyze.

Bundled Soft-white display.

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Price/performance breakthrough.

At \$2,395 the Multitech 900 delivers the high-performance you demand in

an AT system but at an affordable price to fit within all budgets.

Uncompromising.

While the Multitech 900 introduces innovation it doesn't compromise any industry standards.

For example: *Software compatibility* with programs designed for the IBM PC/AT and PC/XT; *hardware compatibility* to tie into your networking options; full one-year warranty and guaranteed support from Multitech, a company with a proven track-record in quality microcomputer manufacture; and, *Nationwide service** that is convenient and dependable. Call us today for more information about the Multitech 900 or our full line of personal computer products.

	CPU Speed	Motherboard Memory	Max. # of Half-Height Internal Drives	Display	Operating System	Warranty Period	Suggested List Price
Multitech 900	10 or 6 MHz Keyboard, Software or Hardware Switchable	512K RAM Up to 1MB	5	Hi-Res. Soft-white	MS-DOS 3.1	12-Months	\$2395
IBM PC/AT	8 MHz Only	512K RAM Up to 640K	3	Option	Option	12-Months	\$5295*
Sperry PC/IT	6, 7, 16 or 8 MHz Hardware Switchable	512K RAM Up to 1 MB	4	Option	MS-DOS 3.1	12-Months	\$3395
Compaq Deskpro 286	6 or 8 MHz Keyboard & Software Switchable	256K RAM Up to 2 MB	4	Option	Option	3-Months	\$3395
Tandy 3000	8 MHz Only	512K RAM Up to 640K	3	Option	Option	3-Months	\$2599
Televideo Telecat-286	6 or 8 MHz Keyboard & Software Switchable	512K RAM Up to 1MB	3	Hi-Res. Green	Option	3-Months	\$2995**

*Includes 30MB Hard Disk Drive All prices reflect manufacturers' suggested list for base models as of June 4, 1985

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